MOTOR AGE

Vol. XXXI
No. 16

CHICAGO, APRIL 19, 1917

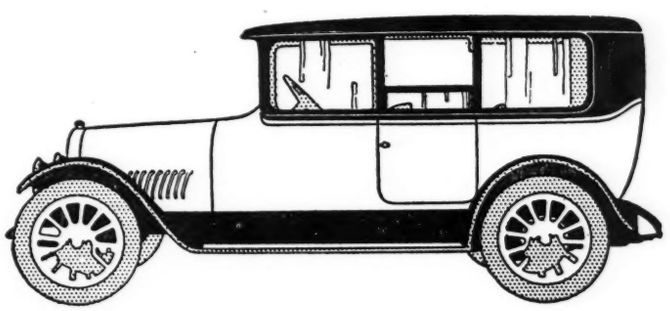
Ten cents a copy
Three dollars a year

Springfield

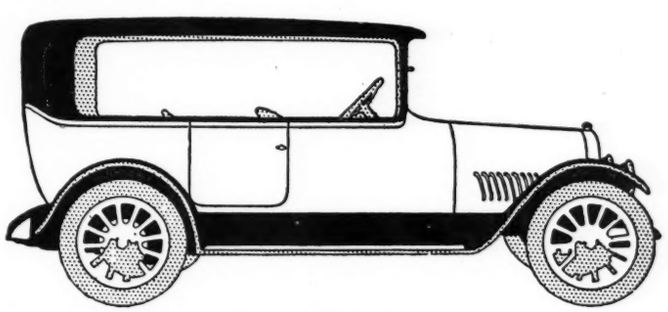
Type Bodies

The World's Ultimate Car
Buy It Today

Use it in stormy weather as a closed limousine like this



And in pleasant weather as an open touring car like this



Springfield Body Company

New York — Springfield, Mass. — Detroit

Editorial Contents—Page 3

Advertisers' Index—Next to Last Page

In This Issue—How Motors Serve the Army

Van Sicklen

ELGIN SPEEDMETERS

Built to the Quality Standards of the Elgin Watch by Elgin Watchmakers

The Van Sicklen Company
Elgin *Illinois*

Service Stations in practically every City in which VAN SICKLEN equipped cars are marketed

MOTOR AGE

Published Every Thursday by the
CLASS JOURNAL COMPANY
Mallers Building
CHICAGO ILLINOIS

Entered as Second-Class Matter September 19, 1899, at the Postoffice at Chicago, Illinois, Under Act of March 3, 1879—Member of the Audit Bureau of Circulations—Copyright, 1916, by the Class Journal Co.

United States, Mexico and U. S. Possessions. One Year $3.00
Canada .....One Year $5.00
All Other Countries in Postal Union.....One Year $6.00

BEWARE OF SUBSCRIPTION SOLICITORS OFFERING PREMIUMS OR CUT RATES—ALL CURRENCY SHOULD BE SENT BY REGISTERED MAIL.

RENEWALS or CHANGES OF ADDRESS should be sent two weeks in advance of date they are to go into effect. Be sure to send old as well as new address to avoid unnecessary delay. RECEIPT of first copy is acknowledgment of subscription.

Vol. XXXI April 19, 1917 No. 16

Contents

HOW MOTORS SERVE THE ARMY..... 5
EDITORIAL—MOTOR CAR WORK—OUR MILITARY TRUCKS..... 12
FORD TRUCK READY SOON..... 15
LABELING GASOLINE BY VAPOR POINTS POSSIBLE 16
CAR'S BIT IN WAR FUND..... 20
CINCINNATI TRACK READY FOR MAY 30 RACE 22
TO AUCTION SHEEPSHEAD BAY SPEEDWAY.. 23
RESULTS OF BATTERY NEGLECT..... 25
STANDARD SPECIFICATIONS FOR 1½-TON AND 3-TON GASOLINE MOTOR TRUCKS..... 32
ELECTRICAL EQUIPMENT OF THE MOTOR CAR 36
MOTOR CAR DEVELOPMENT..... 40

Duplex truck, a new type of roller bearing, Buckeye fire apparatus and dealer's speedster bodies for Saxon cars described and illustrated.

DEPARTMENTS

FROM THE WOMAN'S VIEWPOINT..... 38
ACCESSORY CORNER..... 43
READERS' CLEARING HOUSE..... 44
FROM THE FOUR WINDS..... 50
AMONG THE MAKERS AND DEALERS..... 52

ANNOUNCEMENT

The feature of Motor Age for next week will be a story that answers the question as to where old cars go.

"NORMA" BALL BEARINGS

(PATENTED)

Because it is not easy to distinguish between engine failure and ignition failure—and because many a good engine and many a good car has been condemned for faults of its ignition—and because engine dependability and car performance depend so largely upon magneto dependability and generator performance—the manufacturers of cars of the better class have standardized on "NORMA" equipped electrical accessories. They have found that the use of "NORMA" Bearings in a magneto or lighting generator is an evidence of quality throughout that accessory. They have learned that "NORMA" Bearings are an important factor in assuring the over-all dependability of their car.

Be *Sure*—see that your Electrical Accessories Are "NORMA" Equipped

THE NORMA COMPANY OF AMERICA

1790 BROADWAY NEW YORK

Ball, Roller, Thrust and Combination Bearings

From South Carolina comes Another Story of Studebaker Success — Studebaker Sales in

South Carolina

increased 131.5% in 1916

STUDEBAKER VALUE did it—more than doubled the sales over the entire state.

But that doesn't mean that South Carolina was the only state in the South to show such tremendous sales increases—the South as a whole responded to Studebaker VALUE in no uncertain terms.

In every part of the country Studebaker VALUE made sales speed up. And it is only natural that sales should jump when dealers can quickly and clearly demonstrate that the cars they sell offer the public more for their money.

It is a proved fact that Studebaker dealers offer prospects a superiority of quality, a fineness of workmanship, an artistry of finish that figures from the leading trade journals show are not to be had in other cars except by paying hundreds of dollars more.

Write for further information and dealer proposition.

STUDEBAKER

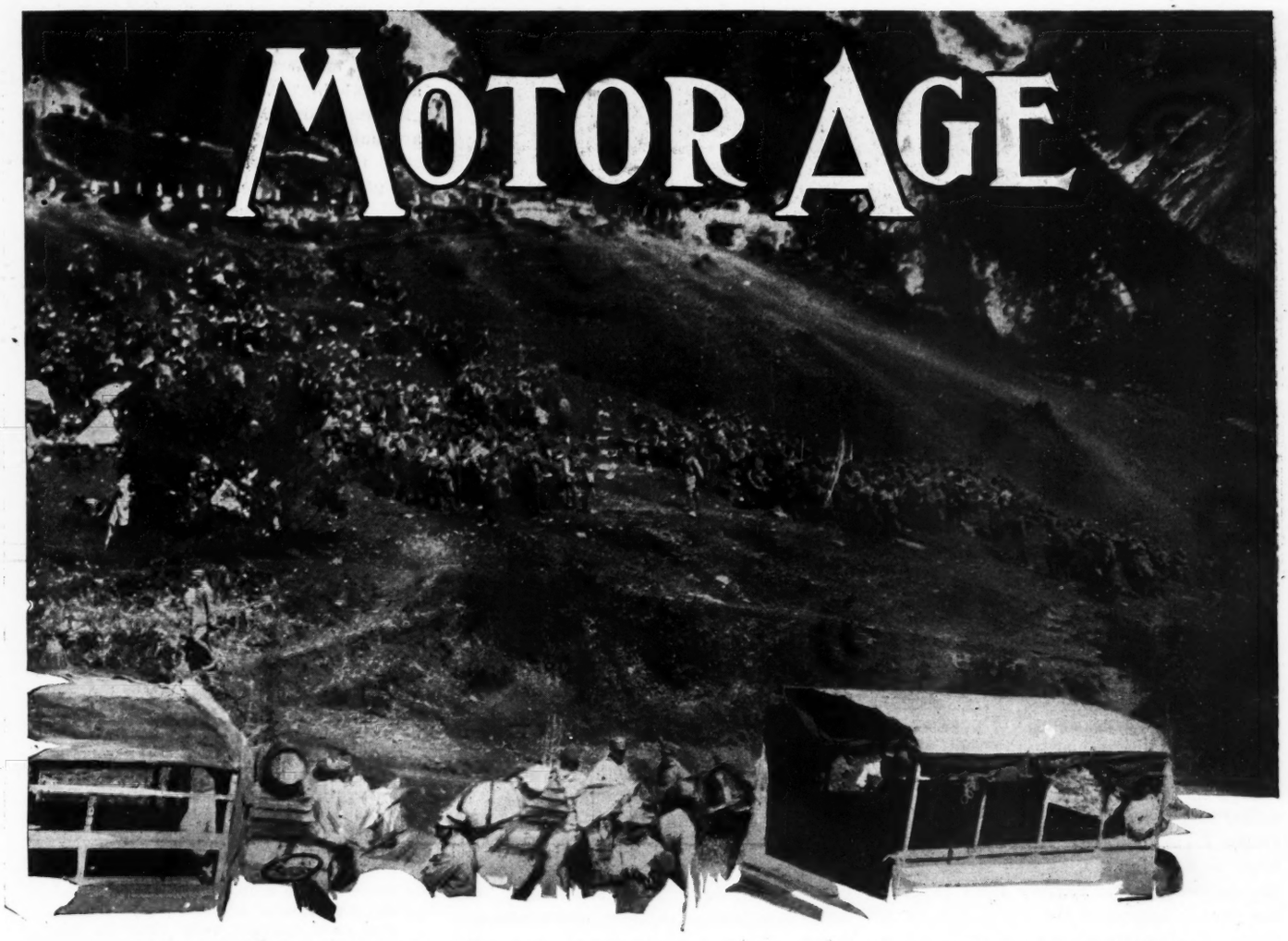
Detroit, Mich. **South Bend, Ind.** **Walkerville, Ont.**

Address all correspondence to South Bend

It pays to be a Studebaker dealer

Vol. XXXI, No. 16 Chicago, April 19, 1917 $3.00 Per Year

MOTOR AGE



Just before the battle. Motor cars and trucks are bringing up reserve troops for an attack in a mountain district

How Motors Serve the Army

Italy's Trucks and Cars Are Examples

By W. F. Bradley

In Two Parts—Part I

EDITOR'S NOTE—W. F. Bradley, special Motor Age representative in Europe, was for four months ending with Jan. 12 engaged in the Italian Ambulance Service on the Italian-Austrian front. While doing regular ambulance duty he had the best of opportunities to study the use of cars and trucks on this, the most difficult front of the European war. In this story he deals with the mechanical features that have proved best in the conditions motor transportation meets in the mountains. The pictures reproduced herewith were taken specially for Motor Age and have been approved by the Italian censor.

WITH a front stretching from the snow-capped Stelvio, near the Swiss frontier, to the sun-scorched plains at the head of the Adriatic, Italian war conditions are the most varied, the most difficult and the most picturesque in Europe. At the Swiss end of the line troops operate among eternal snow, more than 12,000 ft. above sea level; at the head of the Adriatic they hold the barren, rocky, sun-scorched Carso plateau, only about 300 ft. above the sea, with a big stretch of level, monotonous, captured territory in the rear. Between these two points there are extremes of climate and natural conditions as great as are to be found in the whole of the United States; yet the length of the front is not equal to the length of the Atlantic seaboard beween Boston and Wilmington, N. C.

In the Trentino the war began up among the clouds, and has remained there; at the head of the Adriatic the Italians swept into Austrian territory as uniformly level as the southern shore of Long Island. In the Dolomites it is as difficult to kill a man as it is to bring down the swift, sure-footed chamois; around Gorizia and on the lower Isonzo men meet in deadly grip; on the arid Carso corpses lying in no-man's land are mummified by the hot sun until they resemble sleeping negroes in military equipment. In the high Alps men have never seen Mother Earth under the layer of snow; on the lower Isonzo they have never seen snow

Here 3½-ton trucks are taking reserve troops to the front

except miles away on the hills above them. Where both Italian and Austrian troops occupy mountain positions life goes on as usual in the villages just to the rear. Measured on the map the distance between the village and the trenches may be 2 or 3 miles, but there is a high mountain between them, and the village is as well kept, as well lighted, as well swept as in the days of peace. Farther down the line the enemy dominates the plain, and for a depth of 12 miles or more there is not a house free from shell marks, not a church intact, not a civilian to be found, not a road but has been or is liable to be bombarded.

Motor and Mule Together

These exceptional natural conditions make the transport services of the Italian army quite different from those of any other of the Allied powers. Obviously, there cannot be uniformity. Indeed, the first impression of any stranger visiting the Italian front is judged by American standards, the wonderful juxtaposition of ancient and modern. The century-old farms of Sunny Friule, which had never been desecrated by steam, where gasoline was an unknown odor and which are still innocent of American agricultural machinery, have been invaded by a modern army with all the perfections of science and industry. Thus side by side with lazy ox-teams and wagons which ought to fall to pieces but never do, can be found modern gasoline tractors hauling 20-ton loads or wonderful armored cars having a speed and gun capacity undreamed of until after the war cloud burst.

On the road are to be met mule columns, each animal carrying a truss of hay, a single wood beam or a leaky canvas water bag. They are followed by a modern motor car munition column. Sicilian mule carts with scenes from the lives of the saints painted on their panels are overtaken by speedy and luxurious staff cars; 50-mile-an-hour armored cars make dashes into vulnerable parts of the enemies' lines; troops on the march are followed by light, almost flimsy, baggage carts drawn by one or a pair of horses. At one point wounded are brought away individually on the backs of mules; at another place the work is done by the most luxurious motor ambulances the world's motor car industry can produce.

This combination of the finest mechanical and the most primitive animal and human methods of traction is almost inevitable on such a front as that held by the Italian armies. Without gasoline it would be impossible to carry on the war on a fraction of its present scale; yet there are sections of the front which have remained, and probably always will remain, closed to gasoline vehicles. Half a dozen of us, with an hour's time to kill in an advanced post, tried to imagine the war in Italy without the gasoline engine. We reduced it to an affair of outposts occupied by a few hundred men—then gave it up as impossible.

A staff car outside a wrecked house in the captured city of Gorizia

Not only are the transport conditions quite different from those of other Allied nations, but the Italian motor car industry is on a unique footing. Italy is the only allied nation in the war self-sufficing in the matter of cars. Unlike England, France, Belgium, Russia and Portugal, the Italian government has not bought a single American or other foreign motor vehicle for war purposes. There are some American cars serving with the British Red Cross units in Italy; also there are a few French, English and German cars being used as staff cars or in service with the Italian Red Cross. These, however, were already in the country and have been requisitioned since war broke out. Not only can the Italian motor car industry supply all its army's needs, but it has a very important surplus for the Allies.

THE big guns of the Italian army are handled by gasoline tractors. Ninety-five per cent of the army mail service is by motor car, and 95 per cent of the drinking water for the army is delivered by motor truck. This, in brief, gives you the scope of the motor service outside of the ambulance service. The trucks and cars operate very close to the enemy's trenches.

This state of affairs is not due primarily to the fact that Italy has an important motor car industry but has been brought about by a plan which left the industry undisturbed when war broke out. It is quite likely that France could have been as independent had the Allies premeditated this war as much as Germany would like the world to believe. Italy was in the fortunate position of coming into the war at her own time and having the experience of her allies as a guide. Thus she speeded up her motor car factories and left them at their ordinary work, while all her neighbors had to go through a revolution comprising the stripping of the factories to meet the army call for soldiers, a few weeks of stagnation, the acceptance of munition contracts and a reorganization of the plant to meet the new conditions.

Italian Motor Makers

The Italian motor car industry comprises the following factories:

FIRM	PLACE
Fiat	Turin
Lancia	Turin
Bianchi	Milan
Itala	Turin
Spa	Turin
Scat	Turin
Isoota-Fraschini	Milan
Diatto	Turin
Nazzaro	Turin
Zust	Milan
Rapid	Turin
Soler	Milan
L'Aratrice	Milan
Alfa	Milan

Only one Italian motor car firm has disappeared since the war, namely the Aquila-Italiana at Turin. The Nazzaro Co. has passed into new hands, but Felice Nazzaro remains with the old concern. Fiat rightly heads the above list with probably 50 to 60 per cent of the total output of the Italian motor car factories and has produced more war motor cars than any firm in the world. The firms in the list approximately are placed in order of importance, volume of business, though it is not maintained that the list is absolutely correct. It will be noticed that the factories are all in two towns, Turin and Milan, which cities are very conveniently situated for supplying the armies in the field.

Factories Near Army

Compared with England, which has in her army every known make of motor vehicle, or with France, which employs all her home makes and many from America, the situation of Italy is ideal. From Turin to Gorizia or Monfalcone—extreme points of the front and well advanced in the enemy's territory—is not more than a 20-hr. motor and railroad journey. The army has the whole of its motor car factories right at its back, thus getting prompt shipments, a ready supply of spares and simplifying the keeping of stocks to a wonderful degree.

The situation is even more simple than appears from an examination of the list; for instance, 3½-ton trucks are made first and foremost by Fiat, followed by Scat, Spa and Bianchi. Some of the others, of course, produce trucks of this carrying capacity, but they are almost negligible quantities. Trucks of 1½-ton carrying capacity are specialized in largely by Fiat and Lancia. Army bicycles are all produced by Bianchi.

All Trucks Are Good

Another factor in Italy's favor is that she has no bad makes. Examining the product purely from an engineering standpoint, there is far less difference between the best and the worst in Italy than in any other country producing motor cars. It will not be attempted to produce a list in order of engineering merit; it is sufficient to say that the list would not coincide necessarily with the output list, for some of the medium and smaller firms are doing the highest class of work.

The Italian industry is such a close corporation that there are not the differences in design to be found in America, England or France. Several of the makers broke away from Fiat, and although independent, Fiat influence can still be traced. In the manufacturing centers everybody knows what his competitor is doing, with the result that it is impossible for anybody to get away on a new and successful idea without the rest following.

As a consequence of the closeness of the industry, the army types are fewer and more uniform than in other parts of Europe. The biggest truck employed on the Italian front carries a useful load of 3½ tons. There were 5-tonners made before the war, but none is employed by the army. Experience has shown that the 5-tonner is too heavy for work on the Italian front. This also confirms the experience on most portions of the French front.

There is an almost complete absence of trailers, contrary to the practice in France. The explanation is that at practically every point of the line the Italian army is in the enemy's territory and working in hilly country where roads are good so far as surface is concerned but narrow and winding. The French, on the other hand, are well inside their own borders and have a perfect set of highways.

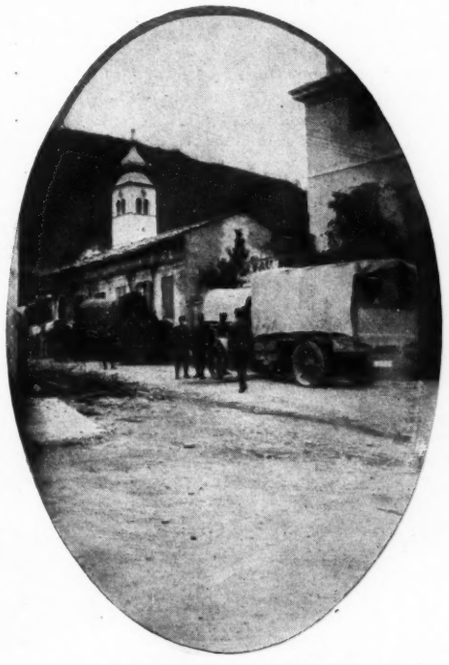
Note the steel wheels, tool boxes and inclosed chain drive of Fiat 3½-ton trucks

CHARACTERISTICS OF ITALIAN MOTOR TRUCKS USED IN ARMY SERVICE

MAKE	LOAD	ENGINE	DRIVE	WHEELS	TIRES
Fiat	3½ tons	3.9 by 7.08	Chains	Cast steel	Twin solid
Fiat	3½ tons	4.3 by 7.8	Chains	Cast steel	Twin solid
Fiat	2½ tons	3.5 by 7.08	Chains	Cast steel	Single solids
Fiat	1½ tons	3.9 by 5.5	Shaft	Disk steel	Twin pneumatics
Fiat	1 ton	3.1 by 5.5	Shaft	Disk steel	Twin pneumatics
Scat	3½ tons	3.9 by 5.9	Int. gear	Cast steel	Twin solid
Scat	2 ton	3.5 by 5.5	Shaft	Wood	Single solids
Lancia	1½ tons	4.3 by 5.1	Shaft	Disk steel	Twin pneumatics
Spa	3½ tons	3.7 by 7.8	Chains	Cast steel	Twin solid
Spa	2½ tons	3.9 by 5.5	Chains	Cast steel	Twin solid
Spa	1½ tons	3.3 by 5.5	Chains	Cast steel	Single solid
Diatto	3½ tons	3.9 by 7.08	Chains	Cast steel	Twin solid
Diatto	2½ tons	3.5 by 7.08	Shaft	Cast steel	Single solid
Diatto	1 ton	3.1 by 5.5	Shaft	Disk steel	Twin pneumatics
Isotta-Frasc.	3½ tons	4.3 by 7.8	Chains	Cast steel	Twin solids
Itala	2½ tons	3.5 by 5.5	Shaft	Cast steel	Twin solids
Bianchi	3½ tons	3.7 by 5.5	Shaft	Cast steel	Twin solids
Bianchi	1½ tons	3.5 by 5.1	Shaft	Disk steel	Twin pneumatics
Nazzaro	1½ tons	3.9 by 5.5	Shaft	Disk steel	Twin pneumatics

TRACTORS AND SPECIAL GUN CARS

Fiat tractor	5.1 by 7.8	Chains	Cast steel	Steel rear, rub. front
Spa gun car	3.9 by 7.8	Chains	Cast steel	Twin solids
Aratrice tractor	5.1 by 7.08	Chains	Cast steel	Steel
Solar tractor	Single cyl.	Chains	Cast steel	Steel



Roadside scene a mile behind the firing line

Italian Truck Design

There are certain features common to all Italian army trucks. They are engine under a hood, platform body with movable sides, four-speed gearbox and either inclosed chain or internal gear drive, the former greatly predominating. Cast steel wheels are in a huge majority, and practically all trucks have rubber tires. There are a few trucks running with steel tires, but they appear to be old models in service long before war was declared. The use of metal wheels is very pronounced. If touring car types are put aside, not more than 10 per cent of the Italian trucks are running on wood wheels. The 3½- and 2½-ton trucks have cast steel wheels, while the 1½- and 1-ton models are fitted with steel disk wheels and pneumatic tires—single in front, twin at the rear.

The cylindrical capacity of the 3½-ton trucks varies from 270 to 400 cu. in., the average being about 320 cu. in. In every case they are L-head castings with partial or complete forced-feed lubrication, pump cooling, magneto ignition, governor on the

A common scene on the Gorizia battlefields—a motor car and a wrecked house

throttle and integral intake manifolds. Gasoline is always under pressure at the rear, neither gravity nor vacuum being employed on trucks. Metal dashes are general, usually being a steel stamping but in some cases an aluminum casting. There is some variety in clutches, but all are of the disk type, leather cone being unknown. Final drive by side chains in a metal housing also forming radius rods is in an immense majority, for it is used exclusively by Fiat and Spa. An alternative system is internal gear drive employed by Scat.

A considerable use is being made of cast iron for the upper half of the crankcase, the casting being sandblasted and finished to give the appearance of aluminum. Base chambers are always cast aluminum, as are timing gear and governor housings and fans.

2½-Ton Italian Trucks

The 2½-ton models have the same general features as the 3½-ton truck, the cylindrical capacity varying from 210 to 270 cu. in., the engines having four cylinders cast in block. The four-cylinder engine predominates in the Italian army, and, with the exception of some of the special tractors, cylinders are block castings. One of the important differences of the 2½-ton type is the use of single solid tires, generally of 140-mm. section, compared with twin solids of 120-mm. section on the larger type. A 2½-ton load can be carried satisfactorily on a single 140-mm. tire, thus avoiding one objection to twins, namely the picking up of stones, which become wedged between the two tires and damage the rubber. This is a defect which applies to twin pneumatics with even greater force.

The third type of truck is the 1½-ton model, which differs in every respect from the larger vehicles. A few months ago MOTOR AGE published specifications of a 1½-ton army truck which strangely was to be everything that the Italian truck is not. The American truck was to be a 14-mile-an-hour vehicle with 300 cu. in. engine, dry-disk clutch, torque and radius arms, cast steel wheels with single and twin solid tires of 36 by 4 in. The Italian army makes use of a great many 1½-ton trucks with a four-cylinder engine of 270 cu. in., fitted with twin pneumatic tires, officially running at 20 but generally running as fast as 30 miles an hour.

ITALY manufactures all the trucks and cars she needs in the war. Her motor car industry is well organized, and a broad variety of designs are lacking. No 5-ton trucks are used—only 3½-, 2½- and 1½-tonners.

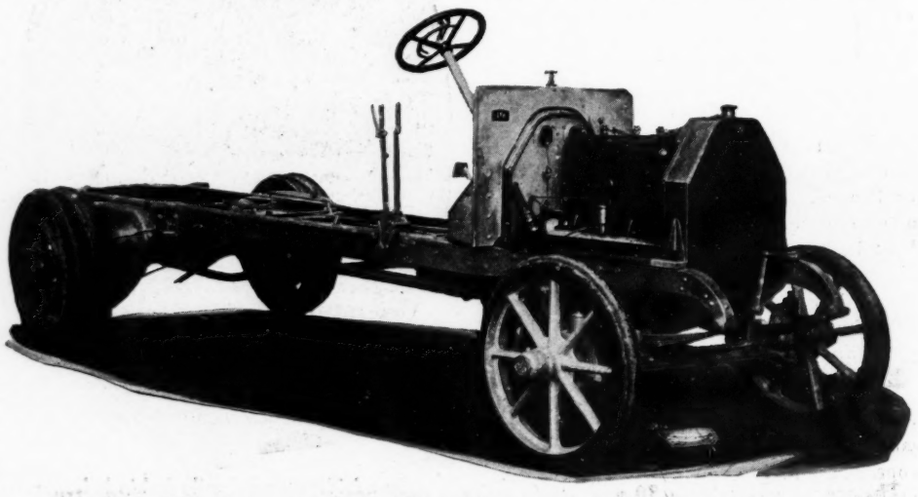
These trucks do entirely different work from that given to the 2½- and 3½-ton vehicles. They operate in small convoys, taking up small ammunition and food, and are also used for the quick removal of troops from one point to another. A body very similar to that of the larger trucks is used, and as it is light it enables a load of twelve to fifteen men to be carried.

It is worth while comparing the specifications of the proposed 1½-ton American truck with those of the Italian vehicle. In the first place there seems to be no use for a 14-mile-an-hour vehicle carrying such a small load as 1½ tons. Even in the mountain districts and on the bad roads close to the lines there appeared to be no necessity for a slow-speed vehicle carrying less than 2½ tons. Below this was required a vehicle for rapid transport, and 1½ tons about fit the bill.

One-ton models were tried and not found satisfactory.

The American specification calls for 300 cu. in. as a minimum; in Italy it is a maximum. The two types are similar as regards number of cylinders, valve location, main bearings and oiling. The use of battery ignition for starting does not appear necessary. There is not a starting battery in the Italian army and hundreds of vehicles in the French army have had their batteries removed, so as to rely entirely on the magneto. The specification is in agreement with Italian practice as regards pump water circulation and drain off, but Italian experience showed that a flat belt gave just as good service as a V-type. Naturally easy provision for tensioning has to be provided. There is agreement on four speeds and reverse but not on double universal joints for propeller shaft. The Italian practice is a single universal. Hotchkiss drive is not used in Italy. Rear axle is bevel or spiral bevel, and not worm or double reduction. Steering knuckle tie rods are located behind the axle, which is undoubtedly the correct position. It has already been said that the Italian conception comprises pneumatic instead of solid tires. Another distinctive feature is the use of steel disk wheels, detachable type. These are ideal for war purposes; after experience of all kinds under conditions right at the front, the writer plumps solidly for the steel disk.

The electric lighting specification of the American truck is not in accordance with Italian practice; nevertheless it is good. Practical experience shows, however, that a tail light is perfectly useless. The Italians adopt pressure feed gasoline, as recom-



This shows a typical Italian design, a Spa 3½-ton chassis

mended in the American specifications. An auxiliary hand pump on the dash is fitted and is really necessary, for connections are always liable to leak, and the pressure system as a whole is very unsatisfactory.

Italian cars do not carry a tenth of the spares mentioned in the American specification, and it is doubtful if any army vehicle anywhere in Europe has such a wealth of parts. Under war conditions if so many parts were given out they would either be lost or stolen within a few days.

The provision of 2 gal. of lubricating oil is good, but there is no Italian car carrying 8 gal. of water outside the radiator. Most of them have no spare water supply and drivers do not realize that they are in need of it.

Except on rails, no steam is made use of in the transport system of the Italian army. Four-wheel drive tractors are also absent.

Very heavy haulage, particularly the removal of big guns, is done by three makes of gasoline tractors which were in existence long before the outbreak of war. They are the Fiat chain-drive tractor with a four-cylinder engine of 5.1 by 7.8, equipped with solid rubber tires in front and steel in the rear; L'Aratrice, a four-cylinder low-built agricultural tractor developed for military work; and the Soler, a single-cylinder, double-piston tractor with six speeds and final drive by side chains. The Fiat and the Soler carry some load on their platforms; L'Aratrice hauls entirely.

In the early days of the war the statement that ammunition was taken directly to the batteries by motor trucks caused a certain amount of surprise and was regarded as a wonderful exploit even by members of the industry. On the Italian front it is the general practice to supply all the batteries in this way. Indeed, the motor truck service does not stop at the line of batteries but goes considerably ahead of it, motor ambulances, for instance working within half a mile of the trenches and in some cases following close on the heels of the cavalry and ahead of the bulk of the infantry.

The big guns, by which is meant calibers of 8-in and upward, all have their ammunition brought up direct by motor truck, much of the work going on in daylight. Whether a daylight service is possible or not will depend naturally on local conditions. Usually guns of this size are 6 miles behind the enemy's front positions, and unless the country is very much exposed convoys can go right up to the batteries without any danger of being seen. The only danger lies from airplanes. It must not be supposed that ammunition is dumped down at the base of the gun. All around the battery substantial dug-outs are constructed, and in each one of these a certain number of shells will be stored. Very often rails are laid from the dug-out to the gun and the shells pushed up as required on a small bogey.

The motor vehicle drivers had a home here. The house is within sight of the enemy, but as the rooms were dry it formed desirable quarters

THE trucks in the Italian army have four-cylinder block engines, cast steel wheels, magneto ignition and four-speed gearboxes. Italy herself furnishes the pneumatic tires, but many U. S. A. solid tires are in use.

The smaller the gun the nearer it is to the trenches, the 75-mm. field pieces being only a short distance behind the infantry. Even these guns, however, rely almost exclusively on motor trucks for their supply of ammunition, but convoys do not usually move up until night, and then in complete darkness, the work of driving, unloading and storing the shells being done without so much as the light of a match being revealed. Here again the ammunition is stored in caves to hide it from the enemy and diminish the risk from explosion if the opposing batteries open fire.

A feature which always excites admiration in the non-professional is the manner in which batteries are concealed. An instance might be given of a length of road, about 1½ miles long, carrying very heavy motor and horse traffic, by the side of which there were forty guns of not less than 4-in. bore. Hundreds of motor vehicles passed directly under the muzzles of the guns—sometimes not more than 30 yds. from them—but it is doubtful if any of the drivers, excepting those who had to go directly to the batteries, could have given the exact location of more than two guns.

Sometimes a daring gun crew will get a heavy gun practically into the trenches. This is only possible on such a mountainous front as the Italians occupy, for a big gun within half a mile of the enemy's trenches is liable to be spotted, while the bringing up of a supply of ammunition is always a delicate matter. One instance can be given where the Austrians succeeded in getting a 4-in. gun into a trench position 500 yds. from the Italian front line trenches. This was only possible by hewing a cave out of the rock, running the gun out to fire it and running it back immediately the shot had been fired. The position might be located to within 100 yds., but to reply with a direct hit on the gun, in such circumstances, was almost impossible.

(Concluded next week)

The writer was driving 50 yds. ahead when a shell burst and hit a Fiat 3½-ton truck

War Prevents Meeting

Martial Activities Take All of Engineers' Time for Special Work

To Open Washington Office with National Defense Council

CHICAGO, April 16—War conditions resulted in the annual summer meeting of the Society of Automobile Engineers scheduled to be held the last week in June at Ottawa Beach, Lake Michigan, being called off to-day by the council of the society in session here. An extensive canvass of many connected closely with the activities of the society showed a general feeling that few of the members could afford the time to spend four days on the East shore of Lake Michigan or at any other place. Each day finds the engineers more and more engrossed in war activities, and correspondingly fewer of the members with spare time for such a meeting.

Instead of four days at Ottawa Beach it was voted to-day to spend one day on the summer meeting and hold it in Washington, D. C., on Monday, June 25. Washington was decided because not a few government departments are very closely associated in the work of the society and selecting Washington is hoped to not only economize time but materially expedite matters.

Agriculture a Problem

The tractor engineers which recently amalgamated with the S.A.E. are confronted with one of the largest problems of the day—the conservation of our agricultural resources and more intensified agriculture. It has been known for a long time that tractor farming means amazingly more than the mere substitution of motor power for animal power.

This situation has brought the tractor in international importance and the present demand for increased yield from our farms means perhaps a government demand for greatly increased tractor production. The lack of standardization in the tractor field as compared with the motor car and motor truck field makes such impossible for a time. The society faces this problem and its first work in the form of a special meeting will be to get the tractor makers and the government agricultural interests working closer.

For the first time the M. & A. M. is participating in sharing the expense for carrying on S.A.E. standards work. It and the N.A.C.C. have contributed a total of $10,000 for this.

The summer meeting of the Standards committee in Cleveland on May 3 will take on greatly increased importance this year, and a large attendance from the society at large is expected. Besides the 140 men on the various divisions of the Standards committee under the direction of Chairman John G. Utz, a call will be made to the society at large to attend, as the work of standardization is of greatest importance in these days of demand production.

It is possible that the new branch of marine engineering recently amalgamated with the society and representing motor boat work such as submarine chasers, etc., will call for a special meeting.

A Washington office of the Society of Automobile Engineers will be opened in connection with the Council of National Denfense as soon as arrangements can be made for such. This action decided upon by the council of the society in session here yesterday and to-day was brought about by the closer co-operation of the society with the various government departments, which work is increasing every day.

The Society is well pleased with the results of its co-operation with the Quarter Master's Department as shown by the specifications of the 1.5 and 3-ton military trucks given out this week. It is possible the society will assist in aviation standardization work, and also in the training of mechanics for aviators as well as in training and supply mechanics for many other parts of the service.

MEMBERSHIP DRIVE SUCCEEDING

Chicago, April 17—Additional stimulus was given the present campaign of the Society of Automobile Engineers by the council of the society in session here declaring that April 25 will be known as Membership Day. On that day each member is asked to give up practically the entire day to getting new members.

So far the membership campaign has been a great success and some of the sections have already doubled their membership. At to-night's meeting of the Mid-West section, held at the Chicago Automobile club, the section announced that it already had twenty new applications and a telegram was read by Councillor Muskovics of the Indiana section stating that that section with a membership of fifty-five has already fifty new applications. No word has come as yet from Detroit where the headquarters of the membership committee are located, but it is expected that Chairman R. O. Gill of the membership committee of the S.A.E. will have one additional applicant for every present member in the Detroit zone. Rumors have it that one Detroit engineer has already thirty applications as a result of his individual efforts.

CINCINNATI TO DONATE MOTORS

Cincinnati, Ohio, April 14—Business men of the Queen city have offered to raise money by public subscriptions for the purchase of a motor ambulance, four 2-ton trucks, seven motor kitchens, six light touring cars and two motorcycles for the use of the First Regiment of the Ohio National Guard, which is preparing to mobilize for war service.

Owners May Volunteer

A. A. A. Considers Plan for Emergency Enlistment Throughout Land

War College Approves—Expects No Commandeering of Vehicles

WASHINGTON, D. C., April 13.—Motor car and motor truck owners can volunteer with the understanding that their services are offered for emergencies, according to the plan the American Automobile Association is considering with the encouragement of the War College.

The War Department takes the position that it can assume no obligations of any character, but is frank to express its approval of the scheme, provided it is in harmony with the organization plans already worked out by the army officers. It also was stated at the War Department that such co-operation with the Government on the part of the car and truck owners will not be under the direct auspices of the Department.

War Department officials do not anticipate that it will become necessary to commandeer private cars for war use, as the supply of both motor cars and trucks suitable for such work is more than adequate at present.

The appointment of the Motor Transport Reserve Committee by the Council of National Defense makes possible a definite plan for the mobilization of motor trucks and motor cars for emergency needs in any part of the country. Motor clubs throughout the country also are active in organizing the car and truck resources of the country to meet war requirements. The work of the committee goes further, however. It will prepare a definite plan for organization of available drivers and mechanics needed for such a mobilization and the necessary layout of suitable highways for transportation purposes will come under its work.

---

500 AMERICAN CARS AT FRONT

Paris, April 13—Section sixteen of the American Ambulance Corps left for the front to-day. Seventeen Americans in two sections will leave within the next fortnight, bringing the number of cars in the American service up to 500.

DETROIT AS AIRPLANE CENTER

Detroit, April 14—The Aero Club of Michigan launched a campaign last night to make Detroit the chief center of the aviation industry in America and, with the immediate object of promoting public interest in air transit and the manufacture of airplanes, bringing a Government school of aviation to Detroit, obtaining an aviation field and increasing the club's roster to 5000 or more.

About 800 engineers, manufacturers, mechanics and others accepted application blanks. G. Douglas Wardrop, editor of Aerial Age, discussed airplanes in Europe and told of the important part they played in the war.

"It is authoritatively estimated that there are 100,000 or more airplanes in use by the warring nations," said Mr. Wardrop. "In England alone there are about fifty factories devoting from half to three-quarters of their time and energy making planes. There are nearly 3000 dirigibles in use alone.

"Every trained aviator that America sends to Europe is worth more than 200 soldiers. We do not hear so much now of the gas attacks as we did last year or of contact patrol attacks. Aeronauts become even more dangerous foes to the man in the trenches than gas. With powerful machine guns on board, they hover over enemy trenches and mow down the men. It is through the work of aviators that the official recording of yardage gained and lost every day is learned."

GEM MAY BUILD AIRPLANES

Grand Rapids, Mich., April 13—The Gem Motor Car Corp. of this city has been offered a contract to build 1000 battle-planes following specifications by French engineers. The contract has not been accepted, pending local developments.

TROOP PROTECTION OF PLANTS

Washington, D. C., April 14—The blowing up of the Eddystone, Pa., shell-making plant and the reported attempts to destroy manufacturing establishments of various kinds which might be engaged in making supplies for the Army and Navy may lead to the employment of troops to guard such establishments, motor car and otherwise, at such times as the Government begins drawing on these plants for their output.

Under the policy of the War Department, which is to give out to the public no advance information touching the uses to which different units of troops are to be put, troops now are being employed—state troops called into the government service—to look after certain private plants devoted wholly or in great part to the manufacture of munitions. It is anticipated that any plots aimed at the crippling of the Government in its war operations will be aimed first at those establishments which manufacture articles of a death-dealing character, and not such plants as turn out incidental, although important, adjuncts to an army, such as motor cars, trucks and motor accessories.

The delay in the ordering of motor trucks by the Government, made necessary by the time required in recruiting the army means, of course, that the Government heads do not at this time have to give to the protection of motor car and accessory plants that attention which it is giving to certain munitions plants, bridges, water supplies, public buildings, etc.

War Effect Is Gradual

Most of Motor Industry is Awaiting Government's Orders

Car and Parts Production as a Whole Remains Normal

DETROIT, April 16—Industrial preparedness and war needs are gradually affecting the motor car industry, though motor car production continues at a normal rate. The great majority of manufacturers still await instruction from the Government, and it is believed that many will not be asked to participate in the preparedness operations. Some already are engaged in the manufacture of munitions, army trucks and airplane engines, but have not been forced to reduce their production of motor cars or parts.

As the situation now stands there are four large motor car makers either manufacturing or preparing to manufacture trucks and airplane engines, three truck manufacturers making army trucks and several parts concerns manufacturing shells, gun-sights and other military necessities. Of these but one parts maker has reduced normal production to allow for munitions activities.

One carbureter maker recently has completed new furnaces which the Government found suited for the manufacture of castings used in assembling war munitions, and arrangements have been made so that this concern will shortly engage in that work. A western manufacturer of carbureters has arranged with the Government for airplane engine construction and soon will enter that field. This maker already has made a special aluminum aviation engine weighing 397 lb., which has been found satisfactory.

U. S. Tags on Trucks

A large motor car maker, who refuses to give any information as to Government work, has replaced the usual state license tags on its service trucks with the tags used by the United States army.

The employees of the Reo Motor Car Co. have organized and are holding meetings to sign up anyone who desires to enlist for military training and volunteer service. The officers are members of the Reo Rifle club which has been equipped by the Government.

The Saxon Motor Car Co. is encouraging the enlistment of its employees in the army or navy by promising financial aid and participation in any bonuses earned in their absence, as well as guaranteeing the men their present positions on the termination of the war. Men of seafaring experience who will enlist will be paid the difference between their present earnings at the Saxon factory and the wage paid by the Government during their service until the Government makes satisfactory provision for caring for dependents of enlisted men. The company makes this offer to experienced men for the navy because the navy is the first line of defense and the Government is particularly anxious to recruit it to its full strength.

Motor equipment valued at $100,000 and ranging from small side cars to touring cars, army trucks and armored machine gun cars will form the equipment of the Thirty-first Michigan regiment when the plans of motor car makers are completed. The plan includes the motorizing of the machine gun company at a cost of $50,000 and the donation of trucks, touring cars and side cars valued at another $50,000 to the different battalions of the regiment. This probably will make the regiment one of the best motorized units in the National Guard. The Owen & Graham Co. donated a truck several days ago, and a group of car makers, who at present prefer to remain in the background, will add $50,000 worth of the equipment.

BRISCOE PRICES ADVANCE

Detroit, April 17—Special telegram—The Briscoe touring car, four-passenger and two-passenger roadster advance from $685 to $725; delivery car, open style, from $700 to $735; delivery car, panel body, from $725 to $765, effective May 1.

FORD WAIVES BRITISH RIGHTS

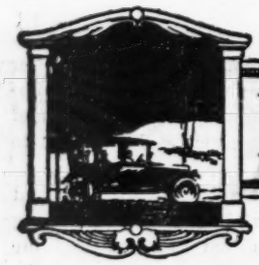
Detroit, April 17—Special telegram—It is reported here that Henry Ford, at the request of the British government, has waived all patent rights on his farm tractor and has cabled the specifications to England so that Great Britain can make tractors for use in the British Isles and in France. It is believed that the tractors will assist greatly in increasing the farm crop production in the Entente countries.

It also is announced that Ford hopes to have thousands of tractors ready for use in the United States and Canada by Aug. 1. The tractor plant and one of the motor car factories are placed at the disposal of the United States Government.

RATE RAISE TO HIT CARS

Washington, D. C., April 16—The Interstate Commerce Commission, which now has before it applications from practically every railroad in the country for permission to increase the freight tariffs from 5 to 15 per cent has not yet acted upon such applications except in a few instances, and these only with respect to certain articles of commerce as to western roads.

The expected advances, naturally will affect motor cars of all makes, and accessories very largely. The expected orders from the government for motor trucks and accessories probably will not come until after the increases in freight rates have become effective, if they do become effective, thus making it incumbent upon bidders for Government supplies to consider the possible increases in submitting their bids.



EDITORIAL PERSPECTIVES

Motor Car Work

RECENT war conditions make it imperative that the motor car industry furnish a great many men of technical ability to the government. Thousands of mechanics will be needed as drivers for motor truck convoys; for mechanics to assist these, and other thousands will be necessary as aviators and mechanics to assist aviators.

THE Eastern division, representing the Atlantic seaboard, expects to require forty motor truck convoys of approximately thirty-three trucks each. This calls for more than 1300 drivers, who will be needed as soon as possible. It calls for a similar number of mechanics. Drivers of these vehicles, it is understood, will have the rank of sergeant.

IF we raise an army of 1,000,000 men it will require approximately 40,000 motor trucks. This means 40,000 drivers and approximately 40,000 additional mechanics. These cannot all be taken from our motor car factories. We will have to conserve our working forces in the factories; otherwise our production will be cut down. Thousands of these mechanics must come from service departments, garages and repair shops in all sections of the country.

LOOKING at the aviation situation, almost an equal demand for intelligent mechanics confronts us. One airplane manufacturer has been asked to furnish 3000 trained aviators in approximately fifteen months. For each trained aviator, five skilled and well educated airplane mechanics are needed. This makes a total of 15,000 good mechanics necessary. An airplane mechanic must be a better educated and more skillful man than a motor car mechanic, as the airplane engine is a more sensitive powerplant than the motor car engine. It is more easily deranged and is harder to tune up. The ordinary mechanic will require a course of several months to fit himself for such work. These are but a few of the demands that an army of 1,000,000 men will make on our motor car industry.

MEN from every city and every town in the country are needed for this work. It is just as important to have competent mechanics in the airplane and motor convoy works as it is to have men manning the artillery or in the ranks of the infantry. One is serving his country as well as the other.

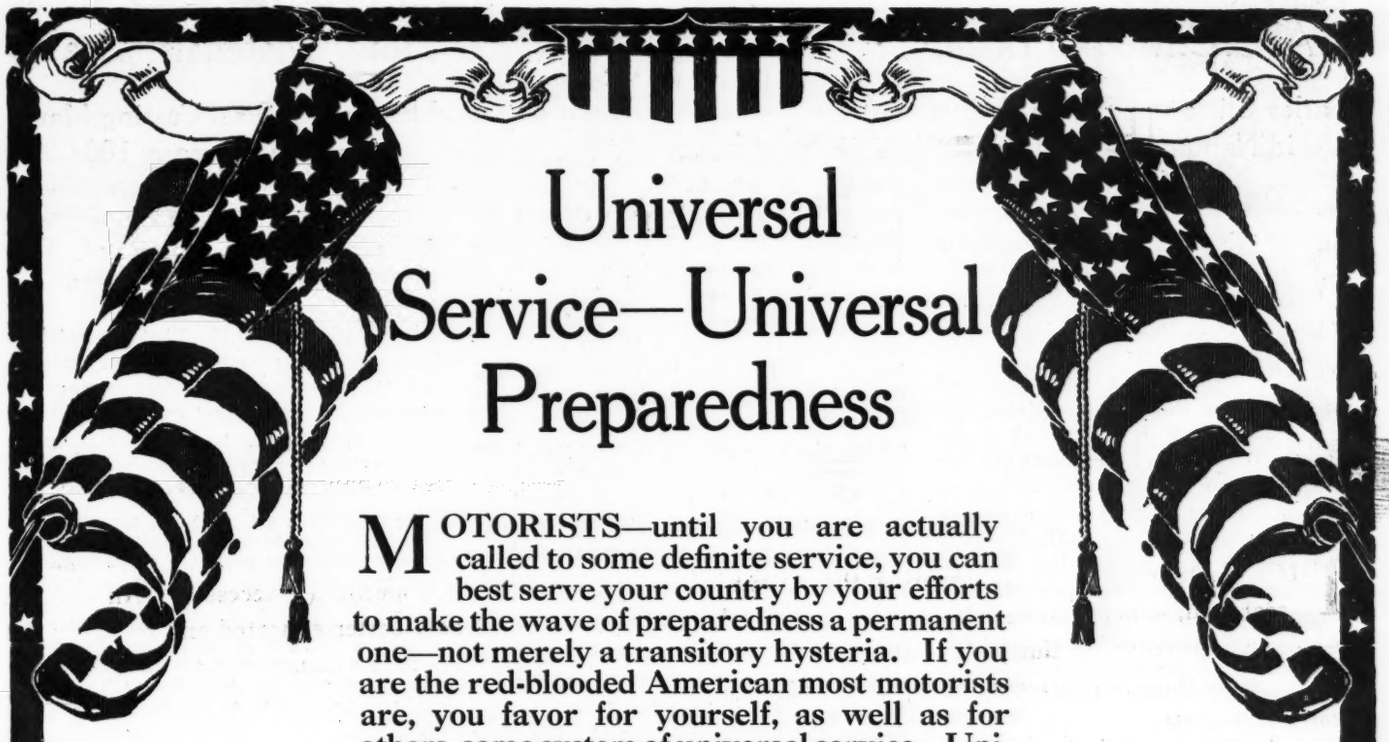
Our Military Trucks

ISSUANCE by the War Department of specifications of 1½- and 3-ton military motor trucks as approved by the Society of Automobile Engineers is one of the latest indications of the importance of the motor truck to our systems of national defense. The War Department, after its experiences in Mexico last summer, reached the conclusion that a special mliitary truck was necessary. The rough roads and the service to which the trucks were subject made it necessary to secure a more robust type of vehicle with more power than normally is necessary in commercial use. Our commercial trucks generally are operated on relatively well paved streets and on business schedules. In war the situation is different. The trucks must operate over good roads and bad roads; they must operate in good weather and bad weather; they must operate with light loads and with overloads; they must operate during the day and during the night; they must operate at higher speeds than our cities will permit; and often under circumstances which call for special stamina.

THE specifications for the 1½- and 3-ton trucks, published elsewhere in this issue, have been drafted by the War Department and approved by the Society of Automobile Engineers with this special point in view. The engine is larger than that required in the average business truck, and there are many other changes deemed necessary for this service, the four-speed transmission; maximum clearance; three-point suspension of the engine; three-point suspension of the gearbox, which must be a special unit; locking differential; alloy steel springs, and careful workmanship.

THE War Department is to be congratulated on calling into conference with it the S.A.E. and endeavoring to draft specifications that will bring as little hardship as possible on the truck manufacturers and make it possible for truck manufacturers to bring out many motor trucks in the shortest possible time with the least possible expense. Originally, when the War Department began drafting these specifications, there were many minor engineering details that would have been very expensive for truck manufacturers. The majority of these have been eliminated so that the new trucks will be comparatively simple.

COMPARED with some of the European truck specifications our military trucks are heavier, they have larger engines, lower speeds and other specifications which vary from European demands but which seem better because of the poorer condition of our highways and the greater distances to be covered in case of mobilization work.



Universal Service—Universal Preparedness

MOTORISTS—until you are actually called to some definite service, you can best serve your country by your efforts to make the wave of preparedness a permanent one—not merely a transitory hysteria. If you are the red-blooded American most motorists are, you favor for yourself, as well as for others, some system of universal service. Universal military service is a dominant necessity now. Write your senator or congressman that you favor universal service in some form. Lastly—show your colors. Carry your flag on your car.

ALL red-blooded Americans are anxious and willing to serve their country in this crisis in any manner in which they can be most efficient. What is needed most seriously is that the Congress and representatives of the people in government be advised of the willingness of Americans to subject themselves to a universal service, whether it be military in the most literal sense of the word or whether it be military service in a broader term, which implies the utilization of the brain power, manufacturing facilities, agricultural effort and any other facilities of a nation, or of its people, which makes military achievement possible.

Military service itself, the actual fighting unit, is the most essential. It is the most important feature of the nation's defense, without which no other preparation can be successful. This nation is at war today; the people who make up the nation are at war, just as certainly as though each one of us were in the trenches or on the battleships and engaged in combat. The Chamberlin bill now in Congress provides for the training of every able-bodied man for six months during his nineteenth year. It is designed to give every citizen the knowledge of how to protect his country in the most efficient way. It would be the one greatest safeguard against war and it would produce a race of better men physically, morally and mentally than we have today. It would straighten humped backs and give erect shoulders where we have today tho sands of drooping figures and weak constitutions. It is up to the individual citizen of the country to see that this bill, or a similar one, becomes a law, not only for this present crisis but for the safety of the nation in the future. The bill contemplat-s training in special camps. This training is not in the regular service, and expenses are paid. Had we had universal military training years ago, today's situation would lack many embarrassing features. We would not be confronted with the problem of training raw recruits and making an army of raw material, nor would it be necessary to do what is necessary now—wake up the people.

Universal preparedness at this moment means, first, a thorough appreciation of the necessity of universal service, whether this be military service, agricultural service or manufacturing service. It is not possible or wise that all should shoulder a musket, that all should serve a cannon, that all should fly an airship or that all should drive ambulances. It is just as important that some who are best fitted for that work should supply the nerve and sinews of the army; provide the food; drive the tractors that plough the field; build the ambulances; manufacture the cannon and ammunition; feed the country.

N.A.C.C. Men for Board

Charles Clifton and John Willys in National Industrial Conference

Staff of Experts Will Investigate Trade Problems

WASHINGTON, D. C., April 13—Charles Clifton, president of the National Automobile Chamber of Commerce and president of the Pierce-Arrow Motor Car Co., and John N. Willys, president of the Willys-Overland Co., will represent the motor industry on the National Industrial Conference Board, which is composed of national organizations of manufacturers.

The board was organized last May to consider matters affecting industrial development with a view to presenting to the public and to legislative bodies the business man's side of important questions. It includes sixteen national industrial associations.

Under the direction of the board a staff of experts has begun to investigate important industrial problems. The data collected and the conclusions and recommendations of the board based on them will be distributed widely through an official publication, copies of which will be placed at the disposal of representatives of the public charged with the making of laws which affect and regulate the conduct of industry. A digest and interpretation of current happenings in the industrial field also will be issued.

ERICKSON MAKES A TRUCK

Detroit, April 14—C. A. Erickson, former chief engineer of the Scripps-Booth Corp., is en route to Detroit from Warren, Pa., in a truck which he has designed, invented and manufactured, and which is driven through the front wheels. Mr. Erickson has been at work on the plans for more than eight years.

STEAM TRUCK FOR ARMY WORK

Detroit, April 14—The General Engineering Co. is completing a special design of the Doble steam powerplant for use in trucks. The work is being hastened so that a finished truck may be submitted to the United States war department soon for tests.

Among the inquiries received from Government sources it has been asked if the Doble truck can be used with armored cars. Many advantages are claimed for the steam truck in army transport work. It is said that the cost per ton-mile is an exceedingly important factor and that through the use of kerosene Doble would effect a saving of about 25 per cent, and besides it is also possible to use other fuel if kerosene is not available. In fact, if it is found necessary to burn wood or coal, grates which are carried in the truck body may replace the usual combustion chamber. It is also claimed as an advantage that the Doble truck carries 50 per cent less of spare parts than the usual truck.

Details of the Doble truck powerplant are not yet available for publication. The engine is of a very different design from that used in the passenger car, and the weight is supported entirely by the frame. The drive will be through a 3 to 1 reduction at the differential, and the fan will be employed behind the radiator or condenser to insure perfect condensation. Just as in the touring car there will be no clutch or gear shift mechanism in the truck, which, it is claimed, decreases the complexity of the chassis and materially reduces its weight.

CRUDE OIL COSTS LESS

Austin, Tex., April 13—If the price of gasoline continues to be governed by the quantity of production and price of crude oil, a reduction may be expected soon. The credit balance quotations, or the prices paid for crude oil at the wells by the purchasing companies in the different districts when the same is not sold under contract, show slight decreases in prices, due, it is stated, to the increase of production. The daily output of the Gulf coast oil fields is now about 85,000 barrels, which is greater than at any time during the last two years. The prices paid for oil in these fields range from 90 cents to $1.05 a barrel. The light crude oil of the North Texas fields is now selling for $1.70 a barrel.

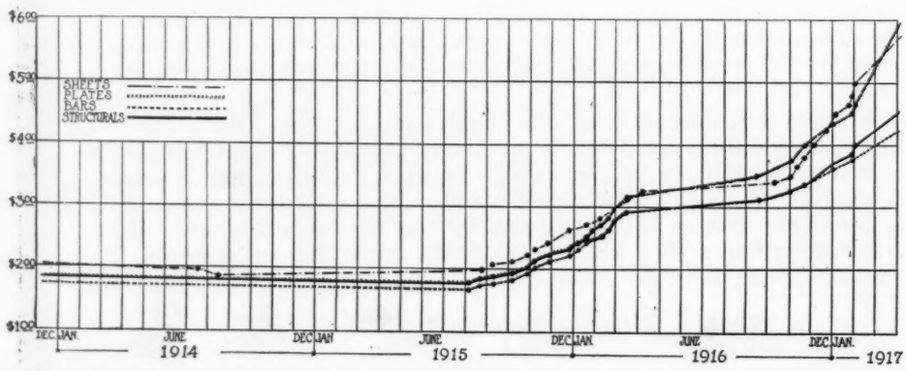


Diagram showing increase in price of steel sheets, plates, bars and structurals between Dec. 10, 1913, and Feb. 2, 1917

How Materials Soared

Elements in Steel Casting Manufacture Increase 100 Per Cent

Advance Covers Period of Two Years—Other Rises Noted

CHICAGO, April 13—That the relative cost of the principal elements entering into the manufacture of steel castings increased over 100 per cent from Feb. 1, 1915, to Feb. 1, 1917, may be seen by a comparison of the list published below, furnished by the Swedish Crucible Steel Co., Detroit:

Pig Iron—1915, $15 per gross ton; 1917, $55 per gross ton. Scrap Iron—1915, $10.50 per gross ton; 1917, $20 per gross ton. Fuel oil—1915, $3.25 per 100 gal.; 1917, $12 per 100 gal. Manganese—1915, $80 per gross ton; 1917, $175 per gross ton. Ferrosilicon—1915, $80 per gross ton; 1917, $150 per gross ton. Fire brick—1915, $28 per 1,000; 1917, $45 per 1,000. Skilled labor—1915, $3.50 per day; 1917, $4.75 per day. Common labor—1915, $2 per day; 1917, $3 per day.

The greatest increase has been in the price of pig iron and oil, which have tripled in the 2 years, although the prices of the alloys, manganese and ferro silicon have felt an approximate increase of 100 per cent.

COLONEL K. C. PARDEE DIES

Chicago, April 13—Colonel E. C. Pardee, for many years prominent in the retail motor trade in New York, died at the home of his daughter, Mrs. Harry Ambler, here yesterday.

RUBBER MAKERS TO AID U. S.

New York, April 16—Special telegram—The advisory commission of the council of national defense has appointed a rubber committee, consisting of H. Stuart Hotchkiss, U. S. Rubber Co., chairman; Arthur H. Marks, B. F. Goodrich Co., and F. C. Hood, Hood Rubber Co. At a joint meeting of the executive committee and rubber advisory committee of the Rubber Association of America, Inc., a committee consisting of same men was unanimously appointed to represent the association and on its behalf to offer services to the government through the council of national defense. It was further voted that this committee co-operate with committees appointed by the council and report to the rubber association from time to time how members could best serve government.

TO PUSH USE OF ELECTRIC

New York, April 13—A conference of manufacturers of electric passenger and commercial vehicles, electric industrial trucks, batteries, tires and accessories will be held April 19 at the headquarters of the National Electric Light Association here. This meeting is called to pick a plan of definite co-operation between manufac-

turers of central stations with a view to promoting a more general use of electric vehicles. Tentative program includes the following features: Analysis of the present electric vehicle situation and the purpose of this conference by Chairman F. S. Mansfield; a paper by C. D. Fairgreave, Anderson Electric Car Co., on advertising and publicity; Getting Local Distribution, P. D. Wagoner, General Vehicle Co.; The Charging Problem in Vehicle Selling, C. A. Street, Walker Vehicle Co.; The Electrical Industrial Truck, author not yet determined; Co-operation, E. P. Chalfant, Anderson Electric Car Co.

POSTOFFICE ASKS TRUCK BIDS

Detroit, April 14—Sealed proposals will be received at the Washington office of the postal department purchasing agent until 10 o'clock on the morning of April 25 for furnishing ⅜-ton, ¾-ton, 1½-ton and 3-ton gasoline trucks and motor vehicle supplies for use of the postal department. Blanks for proposals with specifications and instructions, including blueprints, may be obtained from the purchasing agent.

DANISH WEST INDIES ORDER

Detroit, April 14—The Packard Motor Car Co. has received its first truck order from the Danish West Indies. The order includes a 1-ton and also a 1½-ton truck to be provided with army transport bodies and to be used by the marine corps. It is said that these will be the first power-driven vehicles on the island.

DAYTON AIRPLANE COMPANY

Dayton, Ohio, April 13—The Dayton Airplane Co., Dayton, Ohio, has been incorporated for $500,000. Incorporators are Charles F. Kettering, Orville Wright, Edward A. Deeds, Harry E. Talbott and Harold E. Talbott, Jr. The Wright Field Co. has been incorporated for $10,000 and includes the same incorporators.

S. C. GASOLINE STANDARDS

Savannah, Ga., April 13—A new standard for gasoline will become effective in South Carolina June 1, when the specifications change. It will be a lower standard, but still will give a high grade fuel. It should result in an annual saving on price to the consumers of about $120,000.

The new specifications call for not more than 16 per cent residue at 150 deg. C., with distillation and flash test requirements the same as heretofore. The dry point is fixed at not more than 200 deg. C. Heretofore the residue was 8 per cent, and there was no dry point specification.

Before this it has been necessary for refiners to ship the high grade light gasoline specially distilled for this market. Under the new standard all first grade straight run gasoline, or about the same quality furnished to the United States Navy, will be permitted.

Ford Truck Ready Soon

Experimental Models Have Appeared on Detroit's Streets Already

Price of $500 to Make Vehicle Widely Available

DETROIT, April 13—Exclusive to MOTOR AGE—The Ford truck, which has been a matter of the greatest interest to the motor industry for the last year, is soon to make its appearance. Several experimental cars are running about the streets of Detroit at the present time, and as soon as a few of the last details are cleared up and the Ford factory has caught up to the demand for its passanger cars, the truck will be out. As the Ford company is over 100,000 cars behind on passenger car work, this probably will be in September.

The experimental body fitted to the present truck is a panel side job. A photograph of the truck is shown herewith, this being one of the experimental cars which has been seen on the streets of Detroit.

The coming of this truck in great quantities promises to stimulate the delivery and light commercial field as it has not been affected in the history of commercial vehicles.

Selling at a price which will be close to $500, this vehicle is put within the reach of practically every small merchant in the country. It is a truck adaptable to such a wide variety of uses that to attempt to list them would be next to impossible.

Will Run on Kerosene

Experiments are being carried on at the present time to determine the possibility of operating this truck on kerosene. These will probably be a success when it is remembered that, as MOTOR AGE told some months ago, Holley carbureters are being shipped to Great Britain for installation on the Ford products in Europe. With a truck of this size operating on a fuel costing at from 9 to 15 cents a gallon and probably running a distance of 25 miles to the gallon, the fuel cost will be relatively very small.

The experimental cars are mounted on pneumatic tires in front and solid in the rear, and this will probably be the case with the finished product.

The powerplant is similar to that used on the passenger car. It is a four-cylinder block unit, 3¾ by 4 in., with L-head cylinders. This gives a rating of 22.5 hp. by the S. A. E. formula. It is possible that two or three alterations will be made in the castings for the Ford engine at about the same time the truck gets into production. These probably will be related to the cylinder-head casting, permitting better water circulation in the head and better cooling around the spark plugs. Cooling is by thermo-syphon. The trucks will be governed at a speed of about 18 m.p.h., although this is subject to variation, as some of the experimental trucks which are at present running about the streets of Detroit are not equipped with governors.

Worm Drive Axle

The transmission gearset is the same planetary unit used on the passenger car, the drive being taken from this through a propeller shaft to a worm drive rear axle, in which the worm is mounted over the gear. The gear reduction at the worm is approximately 7 to 1, being about twice the ratio used in the passanger car. The truck is particularly noticeable for its pressed metal parts and forgings. The wheels are artillery type, and the gasoline tank is carried beneath the drivers' seat.

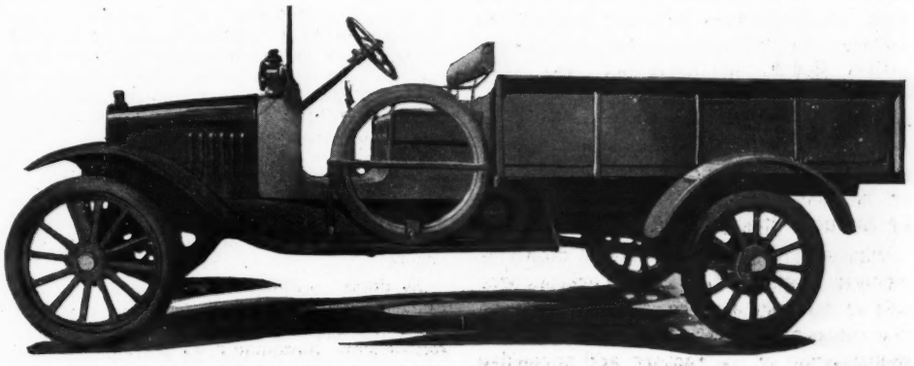
Electric lighting will be used on the truck, and in all probabilities combination oil and electric lamps will be supplied as regular equipment, as shown by the accompanying photograph.

BOATS HELP SHIPMENTS

Detroit, April 16—The motor car industry is receiving considerable aid for shipments by the opening of navigation over the D. & C. route between Detroit and Cleveland, Ohio. Many manufacturers are making large shipments of cars by this route.

ANDERSON INCREASES PRICE

Detroit, April 14—The Anderson Electric Car Co. has increased the price of its models $100 each, effective today.



Experimental Ford truck, several of which have appeared on Detroit streets. It probably will run on kerosene

Labeling Fuel by Vapor Points Possible

U. S. Bureau of Standards May Advise Gasoline Marking—Dr. Burton, Oil Expert, Says Further Change in Quality Need Not Be Feared Soon

CHICAGO, April 16—Possibility of a federal law which will require the labeling of gasoline as determined by its evaporating qualities was the announcement of Dr. Hobert C. Dickenson, physicist of the Bureau of Standards and Bureau of Mines, Washington, D. C., at the meeting of the Mid-West section Society of Automobile Engineers at the Chicago Automobile Club last night. Dr. Dickenson stated that these two government bureaus, of which he was the official representative at the meeting, had almost completed a standard specification for gasoline and probably would suggest the requirement that all gasoline should carry a label having two figures, one the temperature at which a certain proportion of the fuel, perhaps 20 per cent, will evaporate, and another at which perhaps 90 or 95 per cent will vaporize.

Carburetion from All Angles

This announcement was made during the discussion of the symposium on the fuel question, which was the feature of last night's meeting and was led by a paper, "The Fuel Question from the Driver's Standpoint," by F. C. Mock, engineer Stromberg Motor Devices Co., and which included authoritative statements from Doctor Burton, vice-president Standard Oil Co. of Indiana, on the fuel situation for the immediate future as well as the discussion of the efficient use of fuel from the engine manufacturer's standpoint by H. L. Horning, general manager Waukesha Engine Co.

The meeting, which was attended by 150 motor car, truck, tractor and oil engineers and their friends was preceded by a dinner at the Chicago Automobile Club, tendered by the Mid-West section to President Dunham and the Council of the Society of Automobile Engineers now in session in Chicago. At the dinner toastmaster Fred C. Glover of the Emerson-Brantingham Co., tractor maker, introduced President Dunham, whose message was that through the society the Government is planning to utilize S.A.E. members and that they would best serve their country at this time by awaiting their country's call through the society rather than in a burst of patriotism tie up their efforts in some line of service in which they would not be as useful as that planned for them.

This was brought out more in detail by General Manager Coker F. Clarkson, who told of the very close co-operation between the Government and the society in the mobilization of its factory and inventive organization resources and also of the very successful way in which the society's census of its membership for war work is working out.

F. E. Moskovics of Nordyke & Marmon in a very stirring talk emphasized the need of increasing the membership of the society, stating that the work that the society is doing, particularly in means for the country's defense, is out of all proportion to its size; that every one of the 8000 men in the country who are eligible to the society are needed by the Government in the organization in which their best work can be done.

Chairman Utz of the standards committee told briefly of the co-operation between the Quartermaster's Department and the society which has resulted in the development of the standard specifications for army trucks detailed on other pages.

In the presentation of his paper Mr. Mock illustrated very forcibly the difference in vaporization of different grades of fuel. He arranged a manometer in which two grades of gasoline and one of kerosene were held under the same pressure by a mercury column and by heating these showed the variation in vaporization and how it affected the operation of an engine.

In the technical discussions which followed Mock's paper both Doctor Dickenson and Mr. Horning took exception to Mock's statement that the vaporization points could not be taken as a good indication of the value of the gasoline for motor car use.

Herbert Chase, treasurer of the society, gave it as his opinion that more attention must be paid to developing engines for the use of heavier fuel.

Frederick Purdy, Findeisen & Kropf Mfg. Co., brought out the fact that motor car owners must be prepared to sacrifice some feature of car operation and that with present-day fuels and prospects for the future it would be impossible to expect coincident increases in acceleration, power and economy as we have had lately.

G. W. Smith, chief engineer Nash Motors Co., declared that the oft-mentioned difficulty of gasoline in the crankcase to a certain extent is an owner's question; that it is no hardship to ask the owner to change his lubricating oil every 1000 miles and that also we have reached the point where the chemists must get busy.

Mr. Glover then brought up the question of the use of alcohol and stated that until war conditions made it impossible, all of their tractors in Cuba were operating on alcohol, which was made by the individual sugar planters from their refuse at a cost of approximately 8 cents a gallon.

Burton of Standard Oil on Fuel Prospects

Written Discussion by Doctor W. M. Burton, Vice-president, Standard Oil Co. of Indiana

MR. M. A. SMITH, Chairman of Meeting Committe, Mid-West Section, Society of Automobile Engineers,

Chicago, Ill.

My dear Mr. Smith:—

I have your letter of March 16, requesting that a representative of this company present a paper on "Automobile Fuels—Present and Future," which paper will be presented at the meeting of your Society on April 6.

Several papers, bearing on this most important subject, have been published recently in current periodicals. For example, in the March number of "Oildom," page 116, we find a somewhat extended article entitled "The Gasoline Situation Threatening." Also, in the February number of "Petroleum Age," page 3, we find an article by Charles V. Bacon, entitled "Gasoline—Analyses and Interpretation." Further, in the last issue of the "National Petroleum News," Dr. W. F. Rittman presents an article bearing upon the past and present of the gaoline situation, together with some predictions regarding the future.

No doubt, the most of the members of the Society of Automobile Engineers have read these articles, and they appear to contain no extravagant statements, or statements that are not in harmony with the facts.

In Mr. Bacon's article, the writer describes methods of making fractional distillations, which seem to be logical and would conform to the best methods accepted by the industry. He also describes experiences with twenty different samples of gasoline produced by as many different refiners and dealers. He has very little criticism to make of the quality of the gasoline being used, or of its behavior in internal combustion engines. I think it is the experience of every dealer in gasoline that a certain percentage of complaints may be expected from the users of motor vehicles. Defective ignition apparatus, or defective carbureters, or improper adjustments cause faulty workings of machines, and, in the majority of instances, the blame is all laid upon the gasoline, regardless of where the fault actually lies. I think, however, we may conclude that the bulk of the gasoline now used is reasonably satisfactory, that its quality in future probably will not change materially from that which is on the market at present, and that we may concern ourselves, principally, in the future, with regard to the supply of this indispensable fuel.

The pamphlet articles mentioned above, I think, show the situation quite clearly and there is little new material which I could offer. It might not be out of place, however, to offer a few statistics, with some comments as to future operations.

During the last 10 years, since the motor

car and internal combustion engine have become such prominent factors in the economic conditions of this country, the number of machines in the United States has increased from 250,000 in 1907, to an estimated number of 4,000,000 in 1917. The gasoline production has increased in that period from around 400,000,000 gal. in 1907, to an estimated production of over 2,000,000,000 gal. in 1916.

The question might well be asked why the increase in gasoline production has been 400 per cent during the last 10 years, whereas the increase in the number of cars has been over 1000 per cent. Ten years ago a large quantity of gasoline was consumed in this country in the so-called "gasoline stoves" widely used for domestic purposes. Today the gasoline stove has become almost extinct and thus a considerable quantity of gasoline has been released for use in internal combustion engines. There is no doubt but for this extenuating feature, the situation would be much more critical today than it is.

During the 10-year period there has not been a corresponding increase in the production of crude petroleum. It is estimated that during 1917 there will be produced in this country 2,500,000,000 gal. of gasoline. Allowing 500 gal. per year for each motor vehicle, and estimating 4,000,000 motor vehicles in service, the consumption for these vehicles alone would be 2,000,000,000 gal. for 1917, leaving only 500,000,000 gal. for export and for use in other types of internal combustion engines.

Unfortunately, the production of crude petroleum is not increasing in anything like this proportion. There are but two inevitable conclusions: first, the yield of gasoline or motor fuel from crude petroleum must be tremendously increased, to meet the increasing number of internal combustion engines made, or, second, the rate of increase in the manufacture of these internal combustion engines must be lessened.

A considerable increase in the yield of motor fuel from crude oil has been secured during the last three or four years by improved refining processes, but, due to the inability of the refiners to secure necessary steel and other supplies for building stills, it is not at all probable that the increased production of motor fuel will meet the tremendous increase indicated in the manufacture and sale of motor vehicles and other internal combustion engines, and it is also not probable that the production of crude petroleum will increase in the near future to any substantial extent.

Much good could be accomplished by a campaign of conservation and economy in the use of the indispensable gasoline. Much of it is wasted in the running of cars. Engines are allowed to run while cars are standing, and a campaign of economy along this line would be beneficial.

The refiners throughout the country are doing all in their power to secure the largest possible yield from crude petroleum, but there still remains much to be accomplished along this line of conservation, and more would have been accomplished today had not the European war, interfered with the construction of improved and additional equipment.

I appreciate that in this brief paper I have brought out no new matter, but have attempted, rather, to emphasize and reiterate what has already been presented to the public through various papers printed in current periodicals, and I desire to add a word of warning to the manufacturers of internal combustion engines, that the time may come when we will have more of such machines than we will have fuel to supply them.—W. M. Burton, Second Vice-president, Standard Oil Co. of Indiana.

The Fuel Question—From the Driver's Viewpoint

By F. C. Mock, Engineer Stromberg Motor Devices Co.

IT has been suggested that this paper discuss this subject from the standpoint of the carbureter engineer. It has been a peculiar development of motor car use, that the carbureter builder is held continuously and directly responsible for the performance of his product, on whatever car it is placed, and his viewpoint is therefore closely that of the car owner. And since the ordinary driver's requirements of car performance are sometimes different from those of the motor car designer, a consideration from this viewpoint should be of definite value.

In the relatively short time of development of the motor car, there have been many and marked changes in the fuel used. In the early days, from 1902 to 1905, there was no fuel problem; gasoline was a by-product and so volatile that it only required proper metering with air to give perfect and efficient performance; and with a normal running mixture the motors would start, cold, on the second or third half turn of the crank.

It was about 1907, as nearly as I can remember, that we began to have some difficulty starting with the hand crank, and we began to find it necessary to make the mixture adjustment a little richer for easy starting. A short while later we began to notice that a motor would not run quite the same cold as it would after it warmed up a bit, and about 1909, I imagine, it began to be evident that there was something in the motor that seemed to demand a graduation of the mixture. Power and flexibility seemed to demand more gasoline in the mixture than was necessary to simply keep the engine running smoothly. We began at this time to have definitely more trouble with carbon in the cylinders. There was not much difficulty with intake manifold design until we commenced to use more than four cylinders.

Fuel Cause of Starter

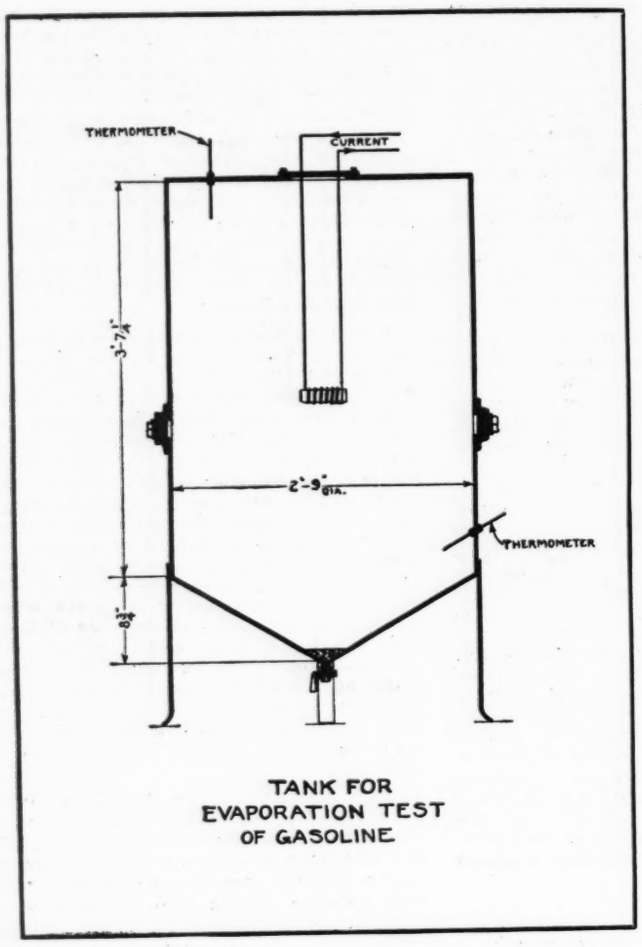
By 1912 the fuel had grown so much heavier that the self-starter was a very necessary feature and practically all carbureters were fitted with some special device for giving a richer mixture for starting. Although the carbureter maker had now practically solved the problem of producing a uniform mixture it was found that this was by no means sufficient to make the motor run, and they began to develop devices for graduating the mixture according to the conditions of evaporating in the intake manifold. For instance, means of making the high-speed mixture richer than the low-speed by means of separate adjustments; and by the use of devices for giving more gasoline on acceleration. At this time we began to have marked difficulty in making the motor cars run properly in the winter time and felt that this difficulty was not due to a defect in the carbureter, though the motoring public did not generally agree with us.

The conditions of 1915 and 1916 are recent in our memory. About this time the gasoline began to contain elements boiling above 360° F. and I think it is more than a coincidence nearly everyone commenced to have trouble with gasoline getting into the crankcase, thinning out the lubricating oil and cutting the bearings. These years also marked the beginning of a period when the motoring public and engineers generally began to appreciate the difficulties under which the carbureter men had been working. The importance of this subject became more fully appreciated and in the last few months there has been a great deal of improvement in the design of intake systems. Practically all new intake manifolds are hot-water-jacketed or have the exhaust heat on some portions of their surface, while practically all carbureter installations provide for a warm air supply.

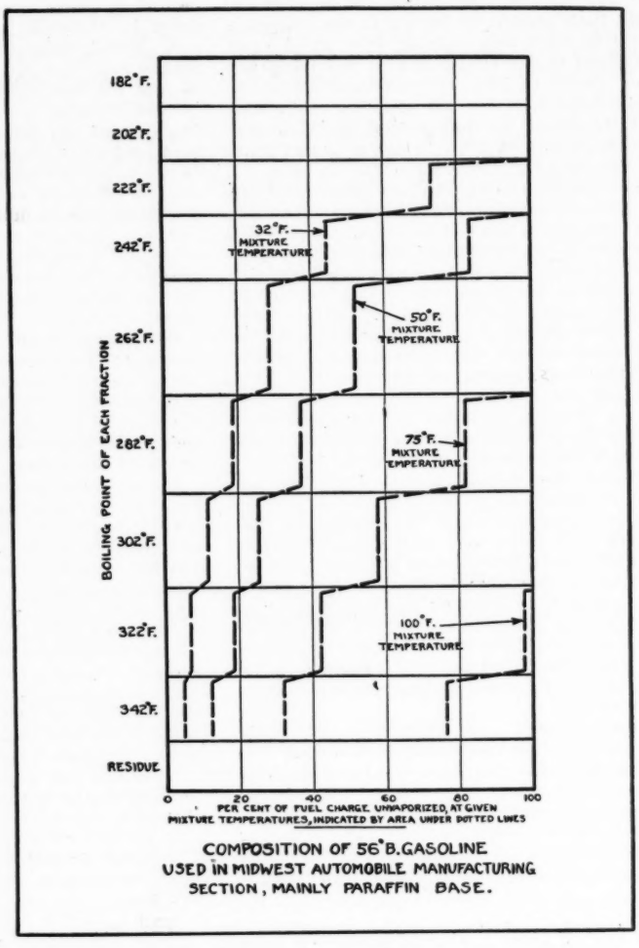
Unfortunately these improvements are difficult to apply to engines alreday built, and many cars four or five years old, in the best of shape mechanically, are unusable through

Copyright, 1917, Kaufmann & Fabry, Chicago.

Annual dinner of Mid-West Section to President Dunham and council Society of Automobile Engineers at Chicago Automobile Club



TANK FOR EVAPORATION TEST OF GASOLINE



COMPOSITION OF 56° B. GASOLINE USED IN MIDWEST AUTOMOBILE MANUFACTURING SECTION, MAINLY PARAFFIN BASE.

six months of the year because they cannot handle the present fuel.

The fuel situation in the country as a whole is further confused, because of the variation in quality. In some localities the gasoline is as good as that used here fourteen years ago, in other places it is similar to that we used ten years ago, and the variation is so great that one single design of fuel intake system can rarely give good operation in all parts of the country.

Essential Properties of Motor Fuel

These differences in operation are not due to any deficiency in thermal energy, because all these gasolines have nearly the same calorific value, but rather to a deficiency in volatility, which interferes with the method by which they are delivered to the firing chamber of the motor.

The fuel situation in the country as a whole is further confused, because of the variation in quality. In some localities the gasoline is as good as that used here fourteen years ago, in other places it is similar to that we used ten years ago, and the variation is so great that one single design of fuel intake system can rarely give good operation in all parts of the country.

The force which drives the pistons of our motors is derived from the combustion of the oxygen of the air charge in combination with hydro-carbon vapor generated from the gasoline. The air is drawn into the cylinders by the suction stroke of the piston, from a common passage or manifold, while the gasoline is sprayed into this incoming air, at a chamber at the manifold entrance, which chamber we call the carbureter. Such parts of the gasoline as are sufficiently volatile, evaporate into vapor and enter the cylinder along with the air. These volatile parts composed about 100 per cent of the early gasoline, but this percentage has diminished until now, with our Mid-West fuels, about 40 per cent can evaporate under the present average operating temperatures.

What becomes of the unevaporated part of the gasoline depends on the velocity of the air carrying it, also upon the nature of the path which the air must travel; and, to a slight degree, upon the fineness of atomization of the gasoline drops. When the drops are small and the air velocity about twenty feet per second, the drops are carried in suspension along with the air so that the effect is practically the same as if the gasoline were evaporated. When the velocity is lower than this, it is much easier for the drops to fall out and this collection or condensation is facilitated when there is a tee bend, or an elbow, as the gasoline particles naturally proceed in their initial direction of motion until forcibly deflected from it by the wall on which they strike. As soon as the drops strike the wetted wall they are subject to surface tension and from then on they cling to the wall of the intake manifold and pass along in a stream. If the air velocity is sufficiently high at the bend, about fifty feet per second, it will wipe much of this liquid part off the walls again and carry it along with the air.

What Gasoline Actually Is

Whenever the gasoline is carried in suspension with the air, it is easy to get good operation with any of our gasoline fuels. It is when the gasoline is not carried by the air that we have our trouble. For motors which run at a constant speed it is easy to design the intake manifold to have the requisite air velocity at that speed. With a motor car engine, however, the air velocity at the highest speed is approximately twenty times that at idle, and it is impossible to select an intake manifold size which will be equally efficient under all conditions.

"Gasoline" is not a liquid of fixed and inflexible composition like water or benzol, but is more nearly a trade name applied to whatever components, obtained in the refinement of crude petroleum, as are deemed possible to use as a motor car fuel. The crude petroleums in different parts of the world are very greatly different and this difference extends to the composition of the gasolines derived from them. For instance, our Eastern Pennsylvania gasolines are supposed to contain mainly hydro-carbon elements of the hexane series, Cn, H2n+2. The gasolines found in the West and South contain elements of the following different series, Cn, Hn, Cn, H2n—2, Cn H2n—4, as well as many others. When the heavier products are "cracked" to make lighter ones, still further variety is found. All these, however, are capable of complete combustion in an automobile motor if properly vaporized, and further have nearly the same number of B. T. U. per pound.

On account of the extreme difficulty of accurate chemical analysis it is common to judge the composition of these fuels by the process of progressive distillation. A measured quantity of the gasoline to be tested is put into a flask and heated. As the temperature rises a point is reached where the liquid begins to boil. The boiling continues, with nearly stationary temperature, until all of the elements which boil at that temperature have been converted into vapor, which is conducted away from the flask and collected in a condenser where the quantity may be measured. If the temperature then is raised, another boiling point will be found, that portion distilled off and so on.

The three charts herewith show the proportions distilled off at different temperatures in three samples which are typical of the fuel commonly used in different sections of this country. The diagrams have been made in such a form that they may be conceived as representing what would happen in a barrel

of gasoline if it were possible to separate the element according to gravity. The lighter elements are at the top, the lower ones at the bottom and the included area represents the relative volume of each present. It will be noticed that the eastern gasoline and the mid-west gasoline are quite closely graded as to the percentage of each element present, while the western gasoline contains an extremely large percentage of the one element which boils at about 280 deg. F.

I might state that the exact boiling point, and the exact proportion boiling off at each temperature are very difficult to measure because the values obtained vary greatly according to the speed with which the distillation is conducted, the nature of the apparatus, and so on. In making these distillations we endeavored to rise from one boiling point to another as quickly as possible, but held the boiling points.

With regard to the operation of the motor car under these different fuels, I would say that a carbureter adjusted for mid-west gasoline would perform practically perfect with 72 deg. eastern gasoline. For some reason the western gasoline (I understand that the Texas and southwestern gasoline is about the same as this) does not operate nearly as well and requires an entirely different carbureter adjustment.

Evaporation Effected by Throttle Position

The percentage of gasoline evaporated and its rate of evaporation further depend greatly upon the position of the throttle, or, more specifically, vary closely with the vacuum in the intake manifold. As a result there is little trouble from failure of the gasoline to evaporate at closed throttle. This fact, in conjunction with the preceding one, gives the reason why we have difficulty handling our present day heavy fuels at wide open throttle and low air velocity. This has been helped to a certain degree by preheating the air charge or by heating the intake manifold, but the heavy elements introduced in the gasoline in the last few years are so non-volatile that their complete evaporation requires heating the manifold and entering air above the boiling point of water, and to so high a temperature that the amount of air charge, and consequent power of the engine, are perceptibly reduced.

Necessity for Compromise in Motor Design

We recently made some experiments by directing an atomized supply of gasoline into a bent elbow, through which air was being drawn, and noting the condition of the mixture issuing from the elbow when the elbow was heated at different temperatures. Though the spray was very fine indeed, so that it would change into a mist and then disappear when the spray jet was directed into the air of the room, in the elbow the action was very bad. The gasoline would strike on the far wall of the bend and drain back out of the elbow in a steady stream, while only a few particles would issue from the mouth of the elbow. This was at temperatures of the elbow from 70 deg. to about 220 deg., with the entering air about 70 deg. When the elbow was heated to about 250 deg., conditions were somewhat better, as about two-thirds of the gasoline drops seemed to make the bend without condensing on the wall and there was consequently less "loading" in the elbow. When the elbow was heated to 310 deg. F. there was no condensation whatsoever and the gasoline came out of the elbow in a white smoke or dry fog.

In developing a motor car engine of the type used today it seems necessary, for the use of fuel no heavier than that we now have, to choose some sort of compromise among the following:

1—Restricting the torque at high speeds by a small intake manifold; or

2—Heating the charge so much that the power is reduced; or

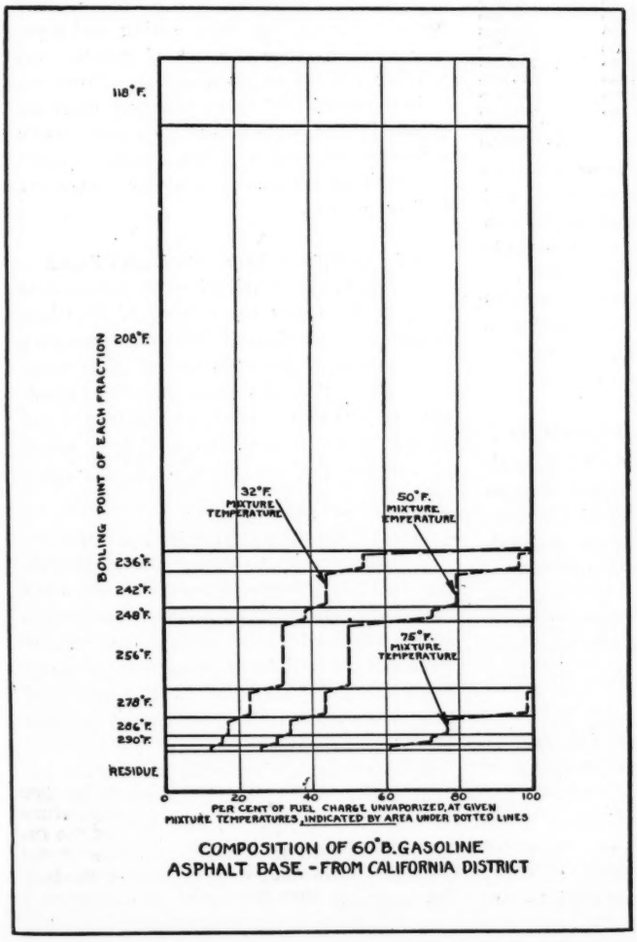
3—Reducing the range of operation (i. e., providing a range of operation of 5 to 45 miles per hour at wide open throttle instead of from 1 to 60); or

4—Using light gasoline, which is now expensive, and will speedily become more so.

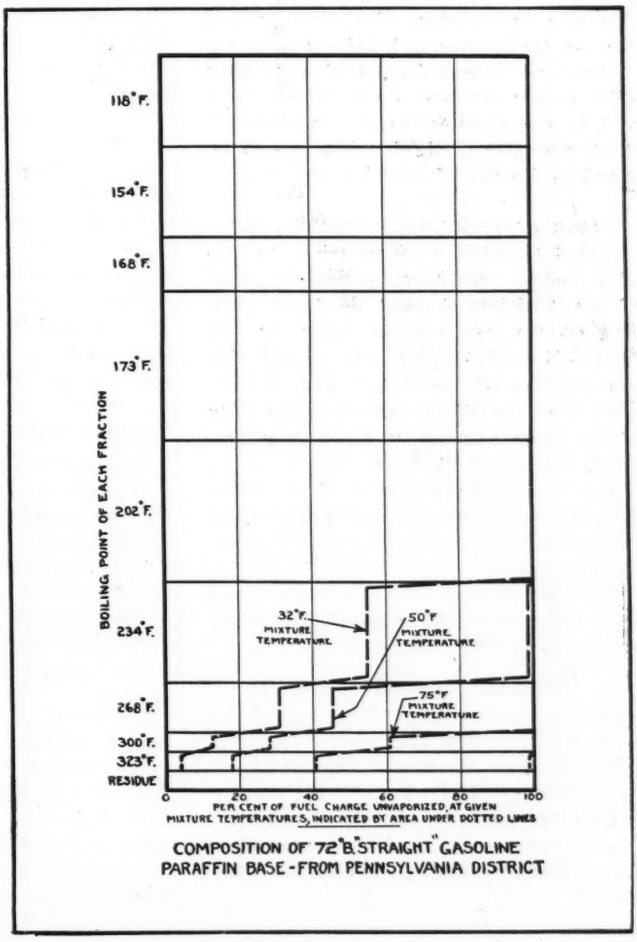
Just here is where it is of value to consider the subject from the driver's viewpoint. A number of engineers would rather do anything else than sacrifice their maximum power per cubic inch piston displacement, which it should be noted is not a satisfactory rating of the power of the motor in the car, because it applies to but one speed, and that one seldom used. This "maximum power" is extremely different from the maximum power the driver knows, which is usually gauged in the way it is most usually employed, by the torque available for acceleration, at ordinary driving speeds. The motorist also objects to paying a high price for gasoline, or having to go to special filling stations to get a particular kind. I further believe that the average man is willing to shift gears when it is necessary to pull through sand or climb a hill below 7 miles per hour, in fact, he should do so for mechanical considerations alone. To practically every motorist it is of much more importance than many well-known mechanical talking points, that a car should warm up to a temperature of good running in a few blocks, yet how few are the cars that will do this. There are many similarly logical reasons why, with the fuel situation as it is, we should be prepared to yield some standards of performance in order to realize certain other standards of economical and convenient operation.

Heavier Fuels

There is a large public demand for the use and utilization of even heavier fuels than the gasoline we now have, and this must be at-



COMPOSITION OF 60°B. GASOLINE
ASPHALT BASE - FROM CALIFORNIA DISTRICT



COMPOSITION OF 72°B. "STRAIGHT" GASOLINE
PARAFFIN BASE - FROM PENNSYLVANIA DISTRICT

tained if motor fuel is to continue at its present price in years to come. Until a very short time ago we have not seen in operation any system which would use kerosene, for instance, without so many disadvantages that it gave no promise, for motor car use. In fact kerosene is carcely satisfactory on motors of constant speed, where there is no limitation as to intake air velocity or as to the amount of heat available. We have recently found that by following a cycle whereby the kerosene is vaporized at a very high temperature, and then mixed with a charge of air at low temperature, that the resulting fog may be kept in complete suspension in the air stream and this should therefore do away with the troubles above described, so far as they relate to conduction of the fuel to the cylinder. There remains the further difficulty of obtaining a vapor in the cylinders, so that the spark can propagate away from the spark plug points, but this can probably be overcome by using a blend, as by mixing the kerosene with some of the elements now found in gasoline; this is also desirable as a step toward economical use of our fuel resources, because such a fuel corresponds more nearly with the composition of the natural petroleum product.

TO AID UNCLE SAM

York, Pa., April 14—Motorists from this city and York county attended the meeting of the International Motor Club Association held in Philadelphia last week to form plans to render service to the Government. The organization is making an effort to obtain 1000 motorists in the Philadelphia district, who will offer their cars to the government. The York branch of the Red Cross and the York county committee for public safety, Grier Hersh, chairman, are tabulating motor vehicles in this city and county, with their drivers, for use for humane and defense purposes.

Fourteen taxicab drivers of York have offered their services to the United States and, in a communication sent to Mayor E. S. Hugentugler, pledged themselves to respond to the call of President Wilson.

"1916 AUTOMOBILE CONTESTS"

"1916 Automobile Contests" is the title of a booklet issued by the contest board of the American Automobile Association. It gives the results of all motor car contests held in 1916 under the rules and with the sanction of the A.A.A. and is compiled from the official records in the office of the contest board by W. Harvey Traband, Jr., and T. B. Shoemaker.

The booklet gives the list of registered drivers, mechanicians, racing cars and stock cars for 1916, also the licensed tracks and speedways.

Copies of the book may be obtained from the contest board of the A.A.A., 501 Fifth avenue, New York. Price, 50 cents.

DURANT IN MEETING

Saginaw, Mich., April 16—A conference was held here late last week which was attended by W. C. Durant, W. L. Day, F. A. Whetten, M. L. Darton, W. W. Murphy and George Hannun. It is believed that this conference had to do with old Marquette plant. Nothing definite could be learned.

Car's Bit in War Fund

McAdoo Would Use Motor Vehicle Tax to Meet Expenditures

Fords and Overlands Would Pay $3,000,000

Washington, D. C., April 17—Special telegram—Secretary of the Treasury William G. McAdoo in his statement to Congress making recommendations as to the raising of money with which to meet the war debt of $7,000,000,000, includes motor vehicles as articles for taxation and suggests rates as follows:

Cars Selling for	Rate
Less than $500	$1
$500 to $750	2
$750 to $1000	3
$1000 to $1500	5
$1500 to $2000	7.50
$2000 and over	10

Looking at this tax, if it is to be applied to each car in use, Ford owners would contribute about $2,000,000 to the fund, while Overlands would add another $1,000,000. Here is how some of the production figures for 1916 would bring revenue to the Government under this new form of taxation:

Car	Production	Price	Tax
Hudson	25,000	$1500	$ 125,000
Reo	25,000	1000	75,000
Oldsmobile	12,000	1500	60,000
Packard	8,000	3000	80,000
Cadillac	20,000	2000	140,000
Studebaker	70,000	1000	210,000
Buick	70,000	1000	210,000
Chalmers	25,000	1750	175,000
Chandler	30,000	1200	150,000
Dodge	70,000	900	210,000
Maxwell	70,000	750	140,000
Oakland	25,000	1200	125,000
Overland	140,000	1000	420,000
Paige	10,000	1200	50,000
Ford	508,000	360	500,000
Total			$2,670,000

In providing that if the present excess profits tax of 8 per cent on corporation and partnership profits on more than $5,000 and 8 per cent of invested capital were made applicable to the calendar year 1916, or made retroactive, the Secretary estimates it would yield $226,000,000. He would give corporations and partnerships, however, until September next to pay the tax.

AERO SQUADRON IS PLANNED

Indianapolis, Ind., April 14—W. E. Stalnaker, vice-president and director of sales of the Pathfinder Co., has offered his services to Harry B. Smith, adjutant general, in recruiting and organizing an aero squadron of 168 officers and men. The decision of the adjutant general is waiting on a reply from the war department, as there is no authority to organize an aero company.

N. Y. CLASS JOURNALS TO AID

New York, April 16—Special telegram—The following resolution was unanimously adopted at the editorial conference here to-day: "The members of the editorial conference of the class journals of New York City here assembled are glad to respond to President Wilson's appeal in his proclamation of April 15 and will do all in their power to lead and inspire the industries they represent to render that patriotic service to the nation which the president has requested."

R. V. Wright, editor of the Railway Age Gazette, emphasized the necessity for getting men and supplies to the seaboard for war purposes and pointed out the overwhelming burden which the Adamson Full-crew Law, the higher taxes, wages, coal and steel prices are imposing on the railway industry.

J. H. Vandeventer, of the American Machinist, reviewed the importance of machine shops and factories in war work especially in furnishing ammunition, stating the government facilities could not produce one-tenth of amount needed. Shells requiring over 5 hr. apiece to make are fired are fired at rate of twenty a minute in French seventy-fives.

BUILDS 1000 CARS IN MARCH

St. Louis, Mo., April 13—The Chevrolet Motor Co. of St. Louis constructed 1000 motor cars in March. This large order was rushed through in response to a demand from New York for 1000 cars to be delivered April 2.

GASOLINE WAR RISE EXPECTED

New York, April 14—Gasoline prices are expected to rise soon irrespective of what effect the war may have on Government purchases. Domestic consumption of gasoline is not yet under the influences that operate during the later spring and summer months, when the use of gasoline for touring will be at its greatest. However, it is expected that there will be a large increase in the consumption this year, while a further expansion of the gasoline output is problematical, practically assuring higher prices.

ST. LOUIS CLUB VOLUNTEERS

St. Louis, Mo., April 16—The Automobile Club of St. Louis has offered to the Government the services of 5000 cars belonging to members of the club and of 3000 members. The offer was made through President E. M. Flesh following a meeting of the Board of Governors who had been asked to canvass the membership on this question.

GOVERNMENT BUYING STEEL

Detroit, April 16—The government continues to place large contracts for steel for the construction of ships, munition plants and army and navy equipments. Fully 100,000 tons will be required by the navy department in addition to the 3,000,000 tons of structural steel contracted for last week.

Railroad demands on the steel mills are light, orders for rails since April 1 amounted only to 60,000 tons, and car contracts have called for only 50,000 tons, while locomotive builders have taken orders for but 129 engines.

Results of Traffic Education

Kansas City Pedestrians Learn to Walk

EDUCATIONAL work can accomplish quite as much as laws can, to secure safety and convenience. Most people want to do what is right, if they only know what it is.

Kansas City, Mo., offers a shining example of the results of educational work in behalf of traffic safety. Long before there was an adequate traffic ordinance, the local safety council, and especially the Kansas City Railways Co., was quietly educating the public on the subject of taking care of itself and looking out for others. The street railway company had sent a man to every public school with an illustrated lecture on safety. He has talked and shown his moving pictures to 45,000 school children, and has talked to more than 7,000 parents and teachers.

Children Educated

Here is the comment of the superintendent of a motor car training school, on the results of that educational campaign:

"We do not have any trouble at all with children getting in the way now; it is the grown folks only that we have to watch out for. Why, even I have got into the habit, at my corner, of crossing the streets when the kids do, for they are always watching to left and right, and avoiding motor cars and street cars. They wait until the coast is clear, and then keep going until they reach the other side."

The children have been thoroughly drilled in the idea that it is a crime to cross a street in the middle of the block. W. S. Woodland, supervisor of safety for the railways company, told a joke on himself in this connection. He said he inadvertently crossed in the middle of the block downtown, and as he reached the curb, a boy shouted at him, "Hey, mister, why don't you practice what you preach?"

Another phase of the educational work of the railways company, is its co-operation with the team and truck owners, especially the large institutions that run many trucks. The company sends bulletins bearing suggestions on proper driving on city streets, which were posted in all garages and stables, and it is notifying any firm whose driver is guilty of an infraction of a traffic rule, or of improper driving. The firms have expressed the greatest appreciation of this co-operation, for they are enabled to bring their careless drivers to time.

The manager of a motor car repair plant in Kansas City had the following to say on this phase of safety work:

"We have lost about 50 per cent of our 'haul-in' business in the last year. For some reason or other there are not nearly so many accidents as there used to be. It is very plain that drivers of wagons and trucks are growing more careful, and despite the very large increase in the number of machines on the streets, the collisions are declining."

The railways company is continuing and expanding this campaign of education. It is worth noting that its suggestions are by no means confined to advice which will reduce the number of collisions with street cars; indeed, most of the work it does merely reduces the number of possible accidents in which the company would not be liable anyway. The object of the company is to make traffic safer on Kansas City streets, and it will get its share in the general improvement.

The local safety council has recently formed a public safety division, which will broaden the educational work already under way. Safety patrols will probably be organized in the schools, to look especially after the crossing of streets near schools. There are some of these patrols now—and they get far better results in controlling the children than do policemen stationed near the schools.

The coming generation in Kansas City is being raised with the knowledge of how to take care of itself, on the public streets.

Tagging the Violator

A systematic plan of dealing with motorists violating traffic regulations has been put into effect by Chief of Police Bushong of Lancaster, Pa. The policemen have been provided with red tags and upon discovery of any violation of the traffic regulations hands one of these tags to the motorist, or if the car has been left standing somewhere, and the officer does not find it convenient to hunt up the driver, then the tag is tied to the steering gear of the machine. A coupon attached to the tag is torn off by the officer and turned in to the chief. If the officer has seen the motorist he secures the number of his license, his name and address and places the information on the coupon. If he does not get this information he simply gets the number of the machine. The violations include speeding, driving without license, excessive use of muffler cutout, violating parking ordinance, obstructing fire plug, lights not dimmed, lights not burning and disregarding police signals.

SALT LAKE FIXES SPEED LIMIT

Salt Lake City, Utah, April 14—Under the new Utah state law which does away with "reasonable speed limits" and allows municipalities to fix their speed limits, the city of Salt Lake has under consideration a revised traffic ordinance. During the period of "reasonable speed" the justices and police court judges have fined motorists who drove faster than 25 m. p. h. in the uncongested districts. The new ordinance, in the hands of the city attorney, would cut this to 20 m. p. h. and make the limit 8 miles across intersections, 15 miles in the congested business districts and turning corners, 12 m. p. h.

PENALTY TO FIT CRIME

The thought is advanced by Osborne I. Yelliott, chairman of the American Automobile Association legislative board, that in designing traffic laws, certain rights of the motorist should be observed and to that end says:

"Every person employing a vehicle which may cause injury to others, unless reasonable care is used, should be compelled by positive provisions of the law, rigidly inforced, to employ a degree of care commensurate with the risk involved to others under each particular condition which may arise. At the same time he should not be bound down or hampered by minute restrictions not reasonably necessary for the protection of other highway users.

Rules to Be Sane

"For these reasons, fixed speed limits and other similar arbitrary requirements are omitted from our rules and for them the association has substituted a series of rules of the road in the more important of which are provided, in effect, that whenever there is reason to apprehend injury to others, the person in charge of the vehicle shall take especial precautions to see that such injury does not occur. Under this theory each situation which arises must make its own law. That law is: 'whenever there is danger of accident you must avoid it.'

"It must follow that the inforcement of the law should be rational. The provisions relating to arrest, bail, trial and appeal should provide for the prompt apprehension and punishment of offenders, but at the same time should be framed with due regard to the fact that the great majority of violators of our road-traffic laws are not in the same category with common thieves, pickpockets, burglars, murderers, etc. Therefore special facilities should be afforded for the prompt disposition of such cases without unreasonable hardship to the offenders."

Mr. Yelliott would graduate the penalty according to the offense so that where the offense is merely technical in nature the fine would be nominal.

Cincinnati Track Ready for May 30 Race

To Open Championship Season With 250-Mile Event and $25,000 in Prizes

CINCINNATI, Ohio, April 14—Practically all details for the opening of the 1917 racing championship season at the new Cincinnati speedway, Sharonville, May 30, are completed. The race will be for 250 miles, or 50 miles less than the race staged at the opening of the Cincinnati speedway last fall. This will offer, in the opinion of the track officials, more opportunities for spectacular driving and more sustained interest than a longer contest.

The prize purse is $25,000, divided into ten awards, the winner to receive the very comfortable sum of $10,000. Several trophies are expected to be offered by local men for special performances during the race. Work has been in progress on the speedway all winter and the course and grounds will be in perfect condition for the race. Several drivers have promised to come to Cincinnati to do their preliminary training, so the track probably will be an extremely busy place by early in May.

The race has been designated as the Second Annual International Sweepstakes Race, and it will be the first of the big events to be decided in this country, according to advices received by President Harry S. Leyman of the speedway from Secretary Kennerdell of the A. A. A. For this reason a large field of starters is expected.

CHEMISTS DISCUSS MOTOR FUEL

Kansas City, Mo., April 14—Gasoline—or, rather, motor fuel—was the paramount subject of discussion and conversation at the fifty-fourth meeting of the American Chemical Society at Kansas City, Mo., April 10-14. The chemists, in their formal papers and privately, told how they were trying to meet the needs of the motor industry, as well as of the war situation and the industrial development, with respect to petroleum and coal products. They pointed to the rapid increase in the production of gasoline by the cracking process, which Dr. Walter F. Rittman of Columbia University said would reach a billion gallons in 1918.

The chemists state frankly they are not making the kind of gasoline that will serve satisfactorily in the engines now produced.

Doctor Rittman discussed the possibility of greater use of kerosene as motor fuel but declared that kerosene has a narrower limit of explosion in air mixture than gasoline, the limit being so narrow that carbureters for it would have to be of great precision and delicate refinement.

Comments of Dr. Gustave Egloff of Columbia University on the availability of benzol, or benzine, a coal tar product, for motor fuel evoked interest. Benzol is needed badly as the starting point in the manufacture of dyestuffs, and enough could be produced now to supply a twentieth of the demand for motor fuel.

The statement frequently was made that alcohol would not be a competitor of gasoline for motor fuel, until gasoline reached 35 cents a gallon. There was no indication that any process of obtaining alcohol more cheaply was in sight.

FACTORY EMPLOYES DRILL

Industry as a whole has responded nobly to the call for patriotism through offers of output, machinery and even the entire plant. A few makers, however, have inaugurated military training also. For instance, the Chevrolet factory at Oakland, Cal., has been giving its employes half an hour each week for military drill, provided the men give half an hour of their own time. The drill is being conducted under the supervision of officers of the regular army. A non-commissioned officer's school also is being conducted. One company is composed of testers and expert mechanics from the factory, who are giving their time to prepare for service in the motor transport branch of the quartermaster's corps.

Two hundred employes of the S. F. Bowser Oil Tank & Pump Co., Fort Wayne, Ind., will undertake a course of drill under the supervision of Captain George Byroade, commandant at Concordia College, Fort Wayne.

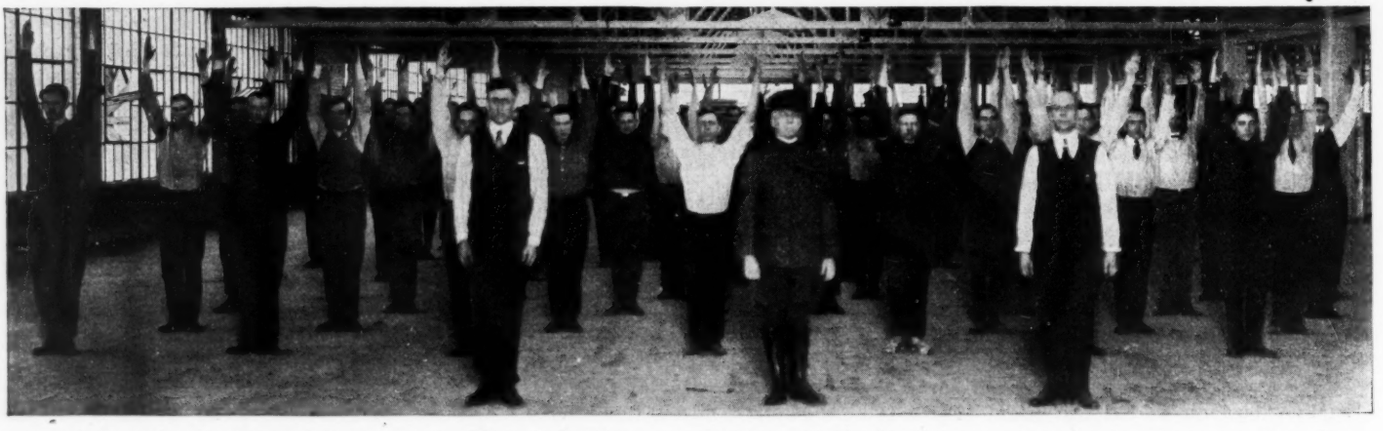
Military training has been added to the educational classes of the Goodyear Tire & Rubber Co.'s factory school at Akron, Ohio. Instruction is to be given under the supervision of former army officers. The Goodyear factory operates in three 8-hour shifts and the classes in military training have been arranged so that each shift of workers may have 2 hours' drill each week.

$60,000,000 IN ROAD BONDS

Chicago, April 16—After a month of consideration, the State Legislature has passed the bill providing for the issue of $60,000,000 in bonds for building 4000 miles of a proposed 16,000-mile system of hard roads in Illinois. The proposition is to be put to a referendum vote at the next general election in the fall of 1918. No one has explained why the legislature thought it necessary to submit the proposition to the people when, almost at the same time this bill was passed, another was passed which provides that the motor vehicle license fees are to be increased 50 per cent beginning Jan. 1, 1918, and another 50 per cent Jan. 1, 1920, this revenue to be used in retiring the bond issue and interest. In fact, this increase in rates is expected to bring into the state funds some $65,000,000 over and above the amount necessary to retire the $60,000,000 bonds and interest, during the period for which the bonds are to run, or until 1944.

SWISS WAR TRUCK 3½ TONS

Paris, April 6—Swiss motor car manufacturers have decided on the adoption of a 3½-ton truck as the most suitable type for military service in that country. The



The educational classes of the Goodyear Tire & Rubber Co. school now include military training under the supervision of former army officers

decision was arrived at after a meeting of the manufacturers and the military authorities. A suggestion was put forward for the creation of a uniform type of truck, to be made by all firms, sold to private users, and which could be requisitioned by the army in case of necessity. No decision was arrived at on this point.

It is practically certain that the Swiss authorities will adopt the French system of truck subsidies. Under this arrangement the military authorities agree to subsidize for the first three years of their existence any privately owned truck of an approved army type. The owner must present his truck annually for examination and must deliver it to the authorities in case of war.

HIGH GEAR, LOW-SPEED CONTEST

Detroit, April 17—Special telegram—The Chalmers Motor Co., which has just engaged William F. Sturm as manager of contests and trials, will hold the first of its tests starting tomorrow noon. This will be a 24-hr. run on high gear to demonstrate the ability of the car to run at minimum speed. The drivers will endeavor to make the lowest possible mileage at the end of 24 hrs. The car will be taken from the stock of Robinson Co., local Chalmers distributor, and will have the first and second speed gears removed.

It is intended at present to have the regular touring setting on the carbureter so that the conditions will be as near touring practice as possible on the car. The test will be run through the outlying districts in the city of Detroit, and one of the objects will be to keep the engine running continually. A route is being selected which will enable the drivers to make the run with as few interruptions as possible. The drivers will be shop and repairmen from the local distributing house. It is the intention of Mr. Sturm to conduct a series of demonstrative tests all over the country and very probably the next one will be made in Boston.

To Auction Sheepshead Bay Speedway

Foreclosure Sale May 1 Probably Will Not End Racing There, However

NEW YORK, April 13—The Sheepshead Bay speedway will be put on the block May 1 at a foreclosure sale in Brooklyn. Harry S. Harkness, president and chief backer of the Sheepshead Bay Speedway Corp., has taken over the mortgage of the speedway, having purchased the $2,040,000 first mortgage for $1,650,000, paying $550,000 in notes bearing his endorsement. Just what are Mr. Harkness' plans in regard to taking over the speedway at the foreclosure sale are not known, but there is a possibility of motor car racing being continued during the first half of the year, as the racing drivers, though signed up to enter the Government service, have not as yet received any definite information as to reporting. Harkness has several of his cars at the track now, which practically indicates that he will continue in the racing game.

The Sheepshead has been in financial difficulties, due to the very heavy overhead expenses. Last month the Supreme Court in Brooklyn handed down a decision ruling that the speedway corporation was indebted to the Coney Island Jockey Club to the amount of $2,135,161 and granting the club a judgment of foreclosure on the corporation's grounds. When Mr. Harkness took over the mortgage, he proposed that the preferred stockholders put up $550,000 and adequate working capital, but as this would mean raising $750,000, the plan was abandoned.

IMPORT BAN TO STOP MOTORING

Paris, April 16—The decision of the French government to prohibit all imports will have the effect of putting a stop to all private motoring. Last year imports exceeded exports to the value of $2,000,000,000 and drastic measures will be taken to release transport and aid in obtaining a more favorable rate of exchange. For the present the import prohibition order is suspended, but it is expected that it will be applied shortly. A committee has been appointed to examine all cases of exception to the order, but it is intimated that these exceptions will be as few as possible. It is not known yet whether importing firms will be given a general exception for each class of goods or whether each consignment will have to be considered on its own merits. It is expected that only just enough gasoline will be allowed to come in to meet military requirements and that private owners will be deprived. Up to the present the French authorities have not placed any restrictions on private motoring outside the war zone.

RITTMAN PROCESS FOR PUBLIC?

Washington, D. C., April 14—Senator James of Kentucky has offered a resolution authorizing the Secretary of the Interior to assign the so-called Rittman process for improvement in the manufacture of gasoline to the people of the United States and to make the process immediately available for public use.

OPENS MOTOR CLASS FOR WOMEN

Detroit, April 13—The Red Cross motoring detachment of the National League for Women's Service has opened a motor class for young women who will take up the study of the mechanism of cars so that they will be able to drive delivery wagons and perform other practical motor work while the men are absent. Classes start April 23.

The Chevrolet factory at Oakland gives its men half an hour a week for military drill, provided they give half an hour of their own time

War News in Brief

New York, April 13 — George Allan Green, chief engineer and superintendent of the Fifth Avenue Coach Co., which operates about 200 motor buses in New York, has sailed for France to take the captaincy of a corps of armored tanks on the Somme front. The British government offered Mr. Green the appointment because of his thorough knowledge of Knight sleeve-valve engines, which are used in British tanks.

As engineer of the Fifth Avenue Coach Co. Mr. Green has had much experience with this type of engine, his company having bought 250 Moline-Knight engines for use in Fifth avenue buses. Before his connection with the New York concern Mr. Green was superintendent of the London General Omnibus Co. He has been in various engineering positions connected with transportation for nineteen years, fourteen of which had to do with design, construction and operation of gas-propelled vehicles. With the Fifth Avenue Coach Co. Mr. Green reduced the cost per mile of operation more than 100 per cent. One of his recent activities was that of developing a complete snow-removal system for the company, by which it removes snow from more than 30 miles of New York streets, on which the buses operate, without interfering with the regular schedule.

St. Louis, Mo., April 16—The Wagner Electric Co., manufacturer of motor car starters, has offered the Government use of the plant which was used for the manufacture of big shells for the Allied countries. This order was completed about a week ago, and the plant so used is being held in readiness for any service the Government may wish.

San Francisco, Cal., April 13—Eighty-five members of the tenth company, coast artillery corps, made a record run from San Francisco to Half Moon Bay to repel an imaginery invasion from the sea. The run was made in 1 hr. and 20 min. in twenty motor cars and two trucks, all of which were Studebakers. The military observer on the test run called it a most satisfactory demonstration. The length of the run was 39½ miles.

Benton Harbor, Mich., April 13—Among the offers being made by various concerns in the motor industry to help in the preparations for war is that of the Climax Shock Absorber Co., Benton Harbor, Mich. It has announced that it will contribute 20 per cent to the Red Cross or other approved fund on every set of Climax shock absorbers sold by it to car owners on or before June 30. The shock absorbers sell at $25 a set, and at present the company is selling them direct to the owner on a trial and money-back basis if not satisfactory. The officers are President, William A. Vawter; vice-president, John Steiner; secretary, Frank E. Coombs; treasurer, William A. Vawter, II; and general manager, I. W. R. Tennant.

LARGE CLASS PUBLICATIONS PLEDGE WAR SERVICES

EXECUTIVE OFFICES UNITED PUBLISHERS CORP., 243 WEST THIRTY-NINTH ST., NEW YORK

April 10, 1917.

Mr. Grosvenor B. Clarkson,
Secretary of The Council of National Defense,
Washington.

Dear Sir:

After consultation with our board of directors, the United Publishers Corp. has decided to offer to all departments of the United States Government the absolute co-operation of our industrial publications covering many leading industries of this country, both in the matter of editorial co-operation and the free use of advertising space, for the purpose of assisting the Government in the mobilization of our industries, publicity in methods of finance and the promotion of any project undertaken by the Government during the present condition of war.

We cover the iron, steel and machinery industries through the Iron Age and Hardware Age, New York.

The automobile and motor truck industry through the

Automobile.....New York
Motor Age.....Chicago
Commercial Vehicle.....New York
Motor World.....New York

The shoe industry through the Boot & Shoe Recorder of Boston.

The building industry through the

American Architect.....New York
Building Age.....New York
Metal Worker.....New York

The dry goods field through the

Dry Goods Economist.....New York
Dry Goods Reporter.....Chicago
Drygoodsman .....St. Louis
Pacific Coast Merchant..San Francisco

We shall seek to interest the active co-operation of these important business interests in their local centers, and shall hope to especially assist in placing the bond issue without expense to the Government.

In any of these matters your commands will receive our prompt and immediate attention.

Yours very truly,

H. M. SWETLAND,
President.

Washington, D. C., April 13—If plans now perfected by the higher officers of the quartermaster's corps of the army can be carried out, the only thing standing in the way being the granting by congress of an appropriation of $100,000 already asked for, a large motor car plant will be established in connection with the Jeffersonville, Ind., quartermaster's depot. The appropriation asked is for additions to the present plant, for the building of which there is plenty of room on the reservation.

Brigadier General Cruse of the quartermaster's corps is taking a personal interest in the plan. He states that if the motor car plant is erected, it will take care not only of the many machines, principally trucks, which the army soon will need, but it can be used to build the bodies for all army trucks, these now being built under contract for the Government.

In addition, the plan is to use this plant for the repair of trucks sent in from the field and the practical buildng of trucks should this be necessary in an emergency.

Chicopee Falls, Mass., April 14 — The Fisk Tire Co. has notified the U. S. Government officials that if they decide to establish a mobilization camp near Springfield it will turn over to them the 45-acre athletic field owned by the company here which would make an ideal spot for such purposes. The Government officials have taken the matter under advisement.

Philadelphia, Pa., April 14—At a joint meeting of the Automobile Trade Association and the Motor Truck Association of Philadelphia on April 10 twenty-five firms pledged themselves to contribute fifty-eight motor cars and trucks to the services of the United States in the war. For this purpose both associations are acting in concert with the Home Defense Reserve. A committee was appointed to formulate plans for the organization and operation of the fleet.

Indianapolis, Ind., April 16—Use of the Indianapolis Motor Speedway as a training station for army aviators is now practically assured. James A. Allison, secretary and treasurer, last week received a letter from the War Department asking when it would be convenient for army officers to inspect the grounds. Mr. Allison replied that the grounds could be inspected at any time and that he would hold himself in readiness to fulfill the promise of the speedway management to turn the property over to the Government to start a training station for aviators. Captain Morrow in charge of aviation in this district and with headquarters in Chicago has inspected the plant and it is understood will report favorably upon it.

Results of Battery Neglect

How to Put Off the Day When a New Battery Must Be Bought—What Lack of Care Sometimes Causes

By J. Edward Schipper

WHEN a man buys a new car he invariably makes a number of resolutions regarding its care. These resolutions taper off in the exactness with which they are observed much quicker than the brightness dims on the car varnish. Mechanically, however, the average American driver, particularly if he is the owner of the car, is taking much more care than was formerly the case.

For the last ten years, or ever since cars have been built in quantities, great sums of money have been spent by car manufacturers for the education of the owner-driver. When accessories of a more important nature began to come into general use, the accessory manufacturers were also compelled to spend large sums of money in keeping the public educated as to the use and care of their product. Now that electric lighting and starting are in use on practically every car, with the exception of the Ford, it has become necessary to again educate the owner-driver, electrically, at least, to a sufficient extent to allow him to understand the general working of his starting and lighting system.

There is one source of energy on the car, however, which is prone to be neglected. It is chemical in its nature, and because it is so little understood it is avoided like most unknown quantities are. This is the storage battery, and when it is remembered that there are probably 2,000,000 of these in use, of which the average life is only 75 per cent as long as it should be, the enormous wastage in money which this neglect causes may be understood.

Fig. 1—Examining the inside of battery through the vent hole in top to see the height of solution

This great loss is not so much due to willful neglect as it is to a lack of understanding of what happens when the battery is not given its proper care. Just because the battery action cannot be visible to the eye it is bound to suffer to some extent, as the old rule of "out of sight, out of mind" applies to the storage battery quite aptly. If the tires are not pumped up they are soft, and the deflated condition can be told immediately by a glance of the eye, hence they are given attention. Furthermore, every driver knows that the tires will not stand up if they are not kept inflated. In the same way, everyone knows that the engine will not run for any length of time if oil is not put into it. What happens, however, if the storage battery is not kept in its proper condition is not so clear and, although volumes have been written on how the care should be given, very little has been said on what actually happens when neglect occurs.

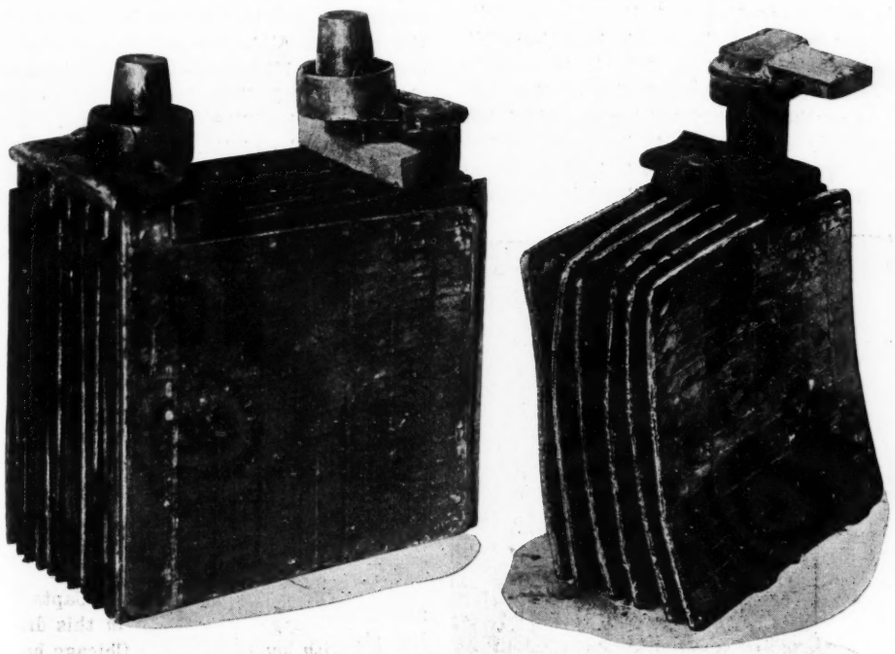


Fig. 2—Left—A complete element consisting of a positive and negative group of plates, hold-down blocks and separators ready for placing in the hard-rubber jars. Right—Buckled plates, the result of overheating the battery

Owner Does Not Know

Anybody can step into the battery station nearest him and secure, free of charge, a booklet telling how to take care of a battery. This will go a long ways with a great many people but with others it takes a knowledge of the consequences to make a deep enough impression to have the directions regarded. Human nature is the same, and it takes a certain amount of pain, either mental or physical, to make the average human being regard instructions. The more remote and out of sight the part, the more it will be neglected. This is true whether it is a grease cup or a storage battery. It is quite possible for a grease cup which is not in sight to be more important than one which is directly before the eyes, and yet the one before the eyes will receive attention when the other will not. It simply comes back to the fact that the car owner will take care of a part or a system if he knows exactly what will happen if he does not, and particularly if he realizes that his pocketbook suffers the blow. The motorist is taking care of the car itself as he takes care of his own physical well being. He knows that good food will preserve his health; he knows that good oil will preserve his motor, but he does not know, taking motorists as a body, just exactly what will happen to his storage battery if he neglects it.

Probably everyone understands the make-up of a storage battery, how it is composed of sets of negative and positive plates forming elements. The action, however, has always seemed vague and yet, from a general standpoint, it is quite simple. The battery is merely a device

which breathes in acid and discharges electricity or, conversely, breathes in electricity and discharges acid. The acid is the liquid which surrounds the lungs, or plates, of the battery. When the battery is charged the lungs are full of electricity and the acid surrounds them. When the battery is discharged the electricity is expelled from the lungs over the wires, while the acid enters them. This is the fundamental process.

Battery Requires Regularity

When a man who has been living regularly for a number of years takes up a new mode of living which interferes with his regularity he suffers a change in his constitutional well being; in fact, he is apt to shorten his life. The same is true of a storage battery. A departure from normal conditions in the battery will shorten its life. A man must perform a certain amount of work, take a normal amount of nourishment, and have a normal amount of rest and sleep in order to remain in perfect physical condition. The same is true of a storage battery. It must do a certain amount of work, have a certain amount of rest in which to recuperate, and it must receive a certain amount of food, which, in the case of the battery, is water, and charging current to remain in a healthy condition. On a car the electrical system is designed to maintain this balance and to provide the battery with its proper amount of work, rest, and food. It is doing work when it is cranking the engine, lighting the lamps and providing ignition; it is having rest when the car is not in use; it is receiving food when the owner is putting in water and when the generator is sending electric current into the battery.

Why Water Is Necessary

So much has been said about the matter of keeping water in the battery that the batteries which perish from this cause have dropped in the last three years from about 90 per cent to 30 per cent. This was the result of big campaigns inaugurated by the storage battery manufacturers which have cost great sums of money. The Willard Storage Battery Co., alone, has spent $250,000 a year in educating the public to adding water and to doing other necessary things in taking care of the battery. But even those who are putting the water into the battery do so because they know that it is what they are supposed to do. What actually happens when the water is not put in is not quite so well understood, and it is interesting to point out exactly what happens when the water is not added.

In order to discharge electricity the lungs, or plates, of the battery must breathe in acid. It is therefore self-evident that only that part of the plate which is in contact with the acid can give further electricity. Plates, therefore, which are only partially covered can only work at partial capacity, and all of the plate above the level of the liquid is dead and useless and is, furthermore, undergoing decomposition. If a man did not use his hands for a long while they would become weak and lifeless. If they were shut off from the blood supply they would wither up and die. It is the same with the storage battery. The unfed and unworked portion does the same thing. The material in it dries up, and this is true of both the negative and positive plates.

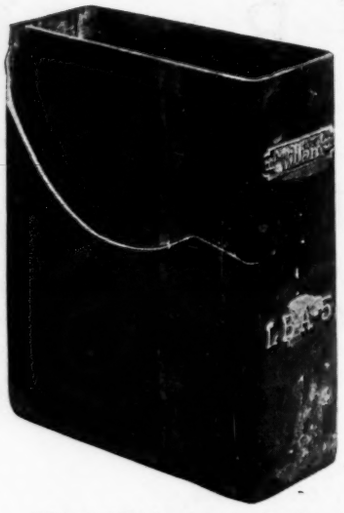


Fig. 3—Breakage is confined usually to jars and occurs only when the battery is subjected to unnecessary jolting. A broken jar should be replaced at once or the whole battery will be ruined

Fig. 4—Short circuits are caused by bad insulation, wiring coming in contact with metal parts of the body, socket grounded with lamp frames, or by laying a tool on top of the battery

The negative plate, which contains a pure gray sponge lead, will crystallize in the dry part. Crystallized or sulphated plates are one of the most common causes of battery failure, or, in other words, one of the most common results of battery neglect. The positive plate when in a healthy condition is a chocolate brown. It is filled with lead peroxide, and when part of this plate is uncovered it suffers in much the same way as the negative plate.

It is quite evident that a battery which is only covered up to half the area of its plates is going to have only half the available capacity. It is difficult to make a battery even of the full size of that carried on the ordinary touring car which has sufficient capacity to do its work. When this capacity is cut down to half the stress on the small area of the plates is enormous when it is doing such heavy work as cranking the engine and, naturally, they soon perish.

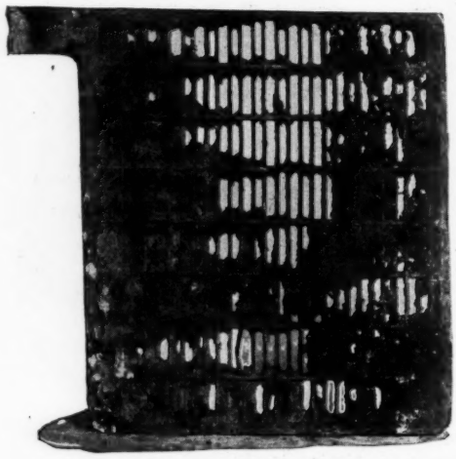


Fig. 5—Crystallized positive plate burned through charging at high rate

Design Presupposes Full Battery

In the same way, when charging, the charge is designed to be taken into a full battery, and when only half the area is available the battery is being charged at twice the rate. In other words, what is known as "charging while dry" is occurring, and owing to the rapid rate at which the small area of covered plate receives the current, the remaining electrolyte rapidly boils away. The dry part of the plate through which the current must flow to get to the submerged part becomes hot, due to the resistance of the grids to the current flowing through them, causing sulphate to form in the negative plate, turning the active material into the hard, white crystalline structure shown in Fig. 5. On the positive plate the active material is cracked and blistered, due to the heat of the grids, and then broken due to the warping or buckling of the plate. The bending of the plates, due to the uneven heating as the uncovered portion becomes hotter than the covered portion, breaks down the wooden separator or insulation between the negative and positive plates, thereby short-circuiting them and rendering them useless. In other words, the battery grids become burned up through charging while dry.

It is only necessary for the owner to stop and think what is happening when his highly efficient generator is putting 10 amp. of current into a dry battery to make him realize how necessary it is that water should be added. The rule of distilled water once a week in summer and once every two weeks in winter should be closely followed. It is only necessary to glance at the illustration in Fig. 16, showing plates which have suffered from dry charging to realize how costly it is to neglect the battery. Furthermore, it is useless for a car owner to attempt to tell the

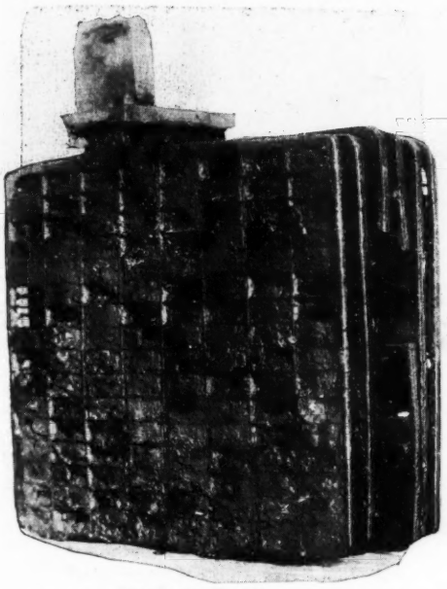


Fig. 6—Plates which were overcharged and consequently heated and later allowed to stand in a discharged condition and to become frozen

man at the battery service station that he has taken care of the battery, as the telltale acid line across the plate showing the level at which the electrolyte was carried clearly indicates whether the battery suffered from normal wear or careless neglect.

Adding water is about the only thing that the owner need do to keep his battery in condition, but there are other things which he should not do. The addition of water regularly so that the plates are always covered to a distance of ½ in. above their tops, will prevent many of the troubles which may occur indirectly. It quite often happens that a battery is only temporarily neglected. In this case it partially crystallizes or sulphates, as it is generally known, and the generator is not always capable of bringing it back to its proper condition. It may require what is known as a reforming charge or a slow charge over a long period, which will have the effect of recharging the active material toward its original condition, although it is very seldom that it can be brought back altogether.

Acid Into Water

Anyone who has ever experimented in chemistry knows that heating occurs when sulphuric acid is poured into water. It is only necessary to put a couple of drops of sulphuric acid to note the temperature rise. Water should never be poured into acid but acid into the water. If the water is poured into the acid the heat rises so rapidly that an explosion may occur.

To bring this simple lesson home to the battery user it is only necessary to recall that when the battery is receiving its charge, acid is leaving the plates and entering the water surrounding them. This naturally causes a rise in the temperature of the solution. The resistance of the grids and other parts of the storage battery to the flow of current into the cells also causes a rise in temperature, and it is for this reason that the electrolyte of a battery

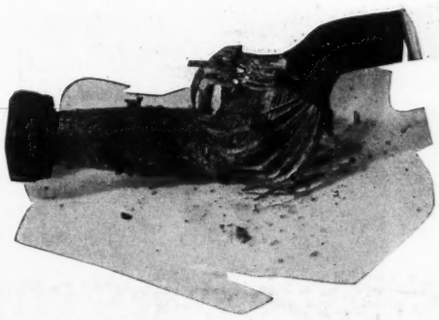


Fig. 7—If the battery is not kept clean corrosion is likely to occur. A little ammonia or washing soda solution should be applied after each examination of the battery

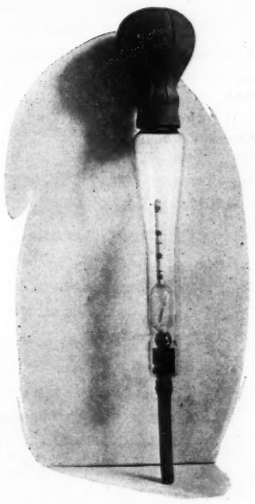


Fig. 8—Common type of hydrometer syringe for testing specific gravity of batteries

receiving a charge will be seen to be gasing or bubbling, and the rise in temperature must be carefully watched. A battery should never be allowed to get above 110 deg. in temperature. If it gets up to 120 deg. it is apt to be destroyed. The more rapid the charge, the more rapid is the feeding of acid into the water and hence the quicker the temperature rise. It is therefore quite important not to charge the battery too rapidly. This will not occur with a properly worked out electrical system, and it will not occur when the water is at the proper height because of the concentrated charging due to the reduced area.

The temperature rise due to overcharging puts the battery in an unhealthy state, in the same way a temperature rise in the human body causes a dangerous fever. The warping of the plates loosens the active material in the lead grids and causes the plates to break down the insulation. The active material also becomes burned and hard. It is only necessary to look at the illustrations showing the difference between a positive plate that is crystallized and one in its normal condition, or at a negative plate which has been sulphated clear through from overheating, to see the danger.

Acid Line Tells Treatment

When a wooden separator is broken down, allowing the negative and positive plates or either side of it to come into contact, this part of the cell is dead. These plates must be insulated from one another in order that the current produced by them may flow over the lines and back again to the battery. When the two plates are in contact, due to the breaking down of an insulator, they are short-circuited and the battery is decreased in strength by that amount.

Battery service men can, with a glance at the separator, tell immediately how the battery has been treated. The acid line of a partially submerged cell is quite apparent upon them. The broken separators indicate a warping of the plates, and the worse the condition in which these separators are, the worse the condition of the battery as a whole, as they reflect exactly the total condition. It will be noted from the illustrations that the separators are grooved on one side and flat on the other. The grooved separator goes toward the positive plate.

It is by the use of the hydrometer syringe that the owner can keep his battery in good condition. This syringe is the same to the car owner as the thermometer

Fig. 9—The left view shows the effect of overfilling. Overfilling causes the solution to run over the top of the battery down the sides of the box. It may get into the metal case and eat out the bottom as well as rot the battery case. Battery box with handles shown on the right. It is made from kiln-dried oak lumber and thickly coated with acid-proof paint

is to the physician. The hydrometer tells the specific gravity of the electrolyte. A completely charged battery will give a reading of between 1.275 and 1.300. If any cell is found to be below this reading continually, the battery should at once be brought into the service station.

Starving the Battery

Batteries can be starved as well as overfed. When a battery is starved it is receiving insufficient charging, and it may be due to the fact that the generator is not delivering enough current or that the starter has been used frequently without sufficient recharging of the battery. A man who has been starved for a considerable time could not be set down before a heavy meal. To do so would be disastrous, and the same rule applies to a battery. A battery which has been overcharged or undercharged for some time cannot be given a heavy charge to bring it back to its normal condition. It must be fed slowly, just as the man must be given a little food at a time in order to gradually bring back his organs to their normal condition. If a heavy charge is sent into a battery which has been starved for some time it will immediately overheat and consequently destroy the active material. If the battery is brought to a service station it is given a slow reforming charge so that the temperature of the electrolyte does not rise above 100 deg. Fahr. at any time. The charge is continued until the reading on the hydrometer syringe rises as high as it will go, and when it is found that the gravity has remained the same for two or three days with continued charging the battery is considered to be rejuvenated as far as possible. In some cases it only takes two or three days to put the battery back in condition. At other times it takes from ten days to three weeks. It must be remembered, however, that in the same way that starvation leaves its mark upon the constitution of a man regardless of his recovery, it has had its effect on the battery.

The normal life of a storage battery is eighteen months on the average. If they are kept filled they are very apt to last longer than this. The case is exactly parallel to the tire. When a motor car tire is kept filled with air it will last longer. If it is run deflated it will suffer, but can be partially restored to its proper condition by complete inflation. At the same time, like the tire, the battery is subject to normal wear, and it is unreasonable to think that a storage battery will last forever even with the best of care.

Fig. 11—Negative plate sulphated from undercharging

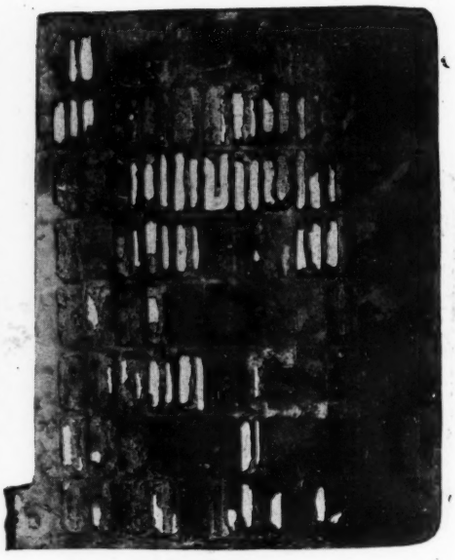


Fig. 13—Effect on a positive plate of freezing

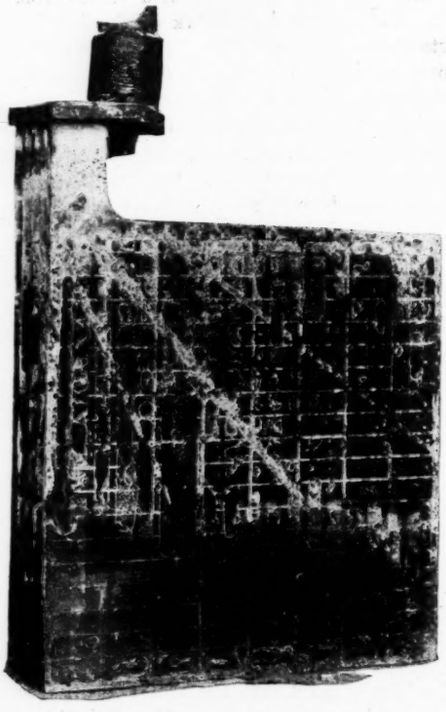


Fig. 12—Positive plate showing effect of charging while dry, with grids bent from resistance and blistered active material. It also shows sulphate deposited on the positive plate from the negative plate

Again, like the tire, it must be given attention from time to time, and a leaky cell must be repaired as quickly as a leaky tube would be. A leaky cell is detected by the fact that the liquid in that cell will drop down much more rapidly than it will in other cells. The leak will not only cause the acid to heat in the battery box but will also result in dry plates in that particular cell, with all the resulting troubles as previously described.

Overloads Other Cells

A cracked battery jar is generally due to traveling over a rough road with the battery not firmly clamped down. Furthermore, if a leaky cell is not attended to at once, the other cells must carry its load in addition to their own, thus causing deterioration again. In filling the battery, damage can also be done by having it too full, because the solution will then overflow, going down into the battery box, and quickly rot whatever metal or susceptible material with which it comes in contact. The water should be put into the battery until the level of the electrolyte is ½ in. above the plates. This gives room for expansion when the battery is being charged and the bubbles are rising.

One of the most serious mistakes often made by owners is adding acid to the battery in order to bring the specific gravity reading on the hydrometer up to normal. No acid should be added by the owner except when far away from the service station, as it takes a battery expert to know when the time for this has arrived. Too strong a solution of acid and water will attack the plates and separators, destroying the insulation and breaking down the entire battery.

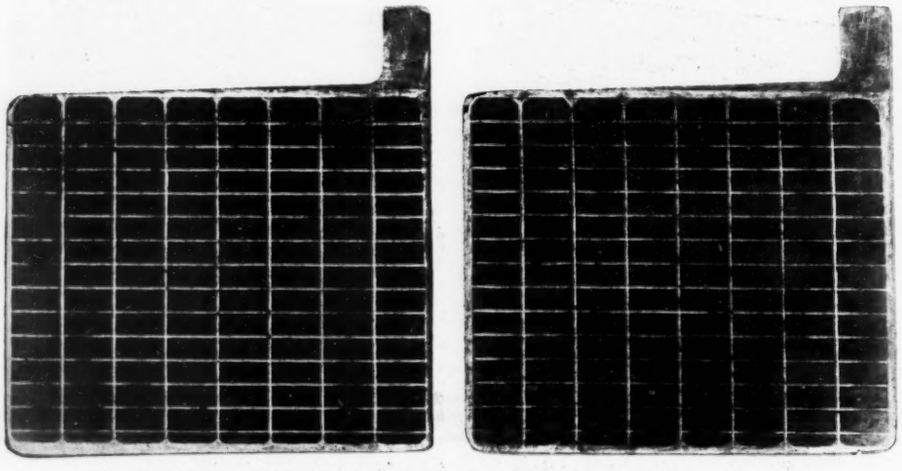


Fig. 10—A pair of formed plates ready to be burned to the connecting straps

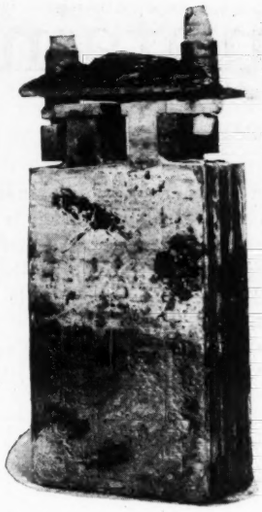


Fig. 14—Negative plates which have been charged while dry, with white part showing sulphate

Improper methods of storing a battery in winter destroy hundreds every year. The two dangers to avoid are: First, not to allow the battery to remain idle in a discharged state, allowing the active material to harden, and second, the battery may freeze. Normally, a battery will discharge itself if left standing for about two months. At that time the electrolyte has a specific gravity of 1.12 and will freeze at 20 deg. above zero. When the battery is fully charged it will not freeze until 98 deg. below zero. Thus, the danger of freezing is quite great on a discharged battery, but remote on one which is anywhere near charged. Even if the battery does not freeze if it stands in its uncharged state, the active material will become hard and stony.

Effect of Freezing

When a battery freezes the effect on the grids is very much the same as when water freezes in a radiator. Owing to the discharged condition the acid has all entered the plates, leaving practically only water surrounding them. The result is that freezing occurs at high temperatures, and as it freezes the ice expansion loosens the material and cracks the grids. As soon as the charging occurs after the freezing the grids expand, allowing the loosened active material to drop to the bottom, with the result that the entire battery is apt to disintegrate. The battery should be fully charged when it is put away for the winter and every two or three weeks should be given an additional charge to bring it up to its proper gravity reading. If the car is put away for the winter and this is neglected a battery that readily started the engine in the fall may be nothing but a container and a mass of muddy, disintegrated material in the spring.

An important point to remember in connection with batteries in which the material has been allowed to crystallize to a certain extent is that the generator can not always bring it back to its proper condition. The active material has passed beyond the scope of balance of the electrical system on the car which probably has a charging rate which quickly jumps to 9 or 10 amp. A battery of this kind should be charged at about 2 or 3 amp. over a long period of time. In a case of this kind the temperature should not be allowed to go over 100 deg. This tends to break up the crystals and puts the active material back into proper condition. The more rapidly a battery is charged, the hotter the solution becomes and, therefore, when giving the reforming charge it is better to keep the temperature low and charge at 3 amp. than it is to charge at a higher rate with an increase in temperature.

It must be remembered that if the temperature rises about 110 deg., overheating results and the battery is apt to be destroyed. The slow, or reforming, charge should be taken advantage of to bring the battery back as near as possible to normal condition every time that it deviates from it. This is the main work of the battery station and it should be taken advantage of at once. The light wooden separators cannot resist the stresses of a buckling plate which has enough force to crank a hard rubber container.

The owner should be alert to keep his electric system in good condition, avoiding short-circuits and corroded terminals. The quick discharge resulting from a dead short does irreparable damage to the battery, and the damage resulting from minor shorts is the same as has been pointed out as due to allowing the battery to stand in a discharged condition.

HYDRAULIC COMPANY EXPANDING

Cleveland, Ohio, April 13—The Hydraulic Pressed Steel Co. is negotiating to acquire a steel mill, the name of which has not yet been announced, of 250,000 tons' capacity. Plans are that the mill will supply the Hydraulic company and the Cleveland Welding & Mfg. Co., which the Hydraulic concern owns, and that the mill also will manufacture a finished product itself. This deal, if completed, will make the Hydraulic company a unit from the source to the finished product. The Hydraulic company plans ultimately to use the mill's entire capacity.

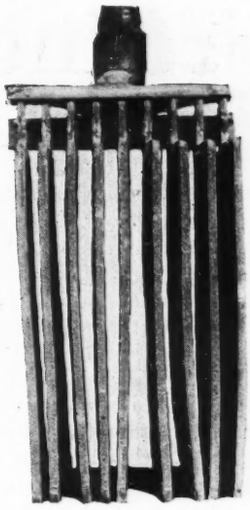


Fig. 15—Showing buckling action on positive plates

U. S. TRUCK SALES $1,746,000

Cincinnati, Ohio, April 13—The United States Motor Truck Co. sold $1,746,000 worth of trucks in the first quarter of this year.

NO RACES AT K. C.

New York, April 13—Kansas City speedway has canceled all 1917 dates in letter to A. A. A. contest board. The burning of the grandstand is the reason given.

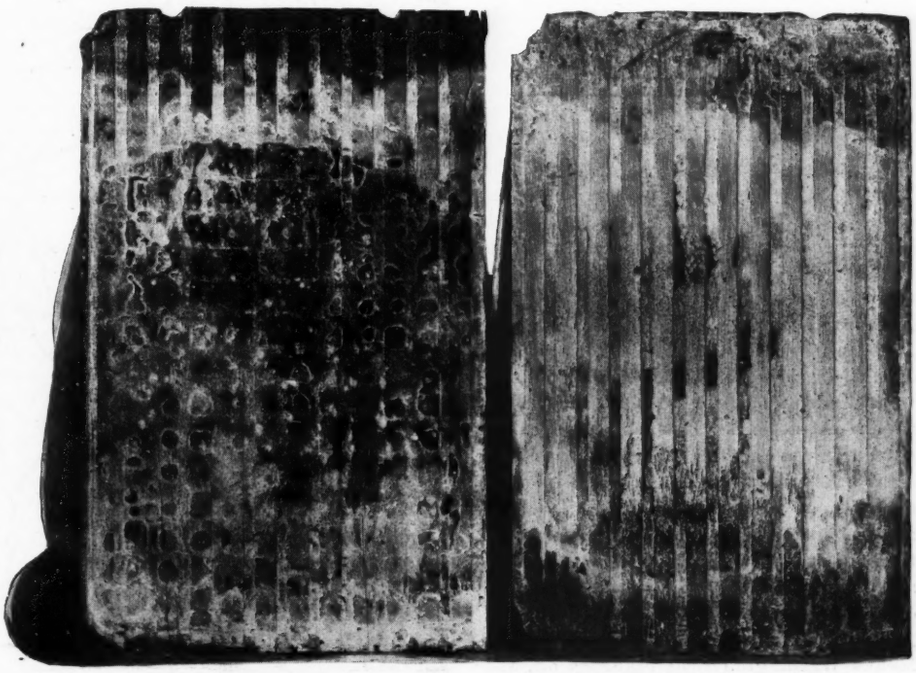


Fig. 16—Samples of separators showing effect of charging while dry

Circling the White Mountains

America's Switzerland Has Superb Attractions

INNUMERABLE points of historic and scenic interest that in many ways are without equal in this country place New Hampshire in the front rank of the favorite touring sections of the United States. Even long before motor cars furnished the principal means of travel over the roads, this district was thronged with tourists from all parts of the country every year, and discerning visitors from other lands made a point of including "The Switzerland of America" in their itineraries.

Especially rich in scenic attractions, the White Mountains, which lie wholly within the state of New Hampshire, imbue the visitor with a desire to explore every vale and crag that every bit of beauty and grandeur may be put on the canvas of memory. These mountains are a part of the Appalachian range and extend from Plymouth on the south to Groveton on the north. The western portion of the range is called the Franconia mountains and the central group, including Mount Washington, is called the presidential range from the fact that its various peaks are named after the early presidents.

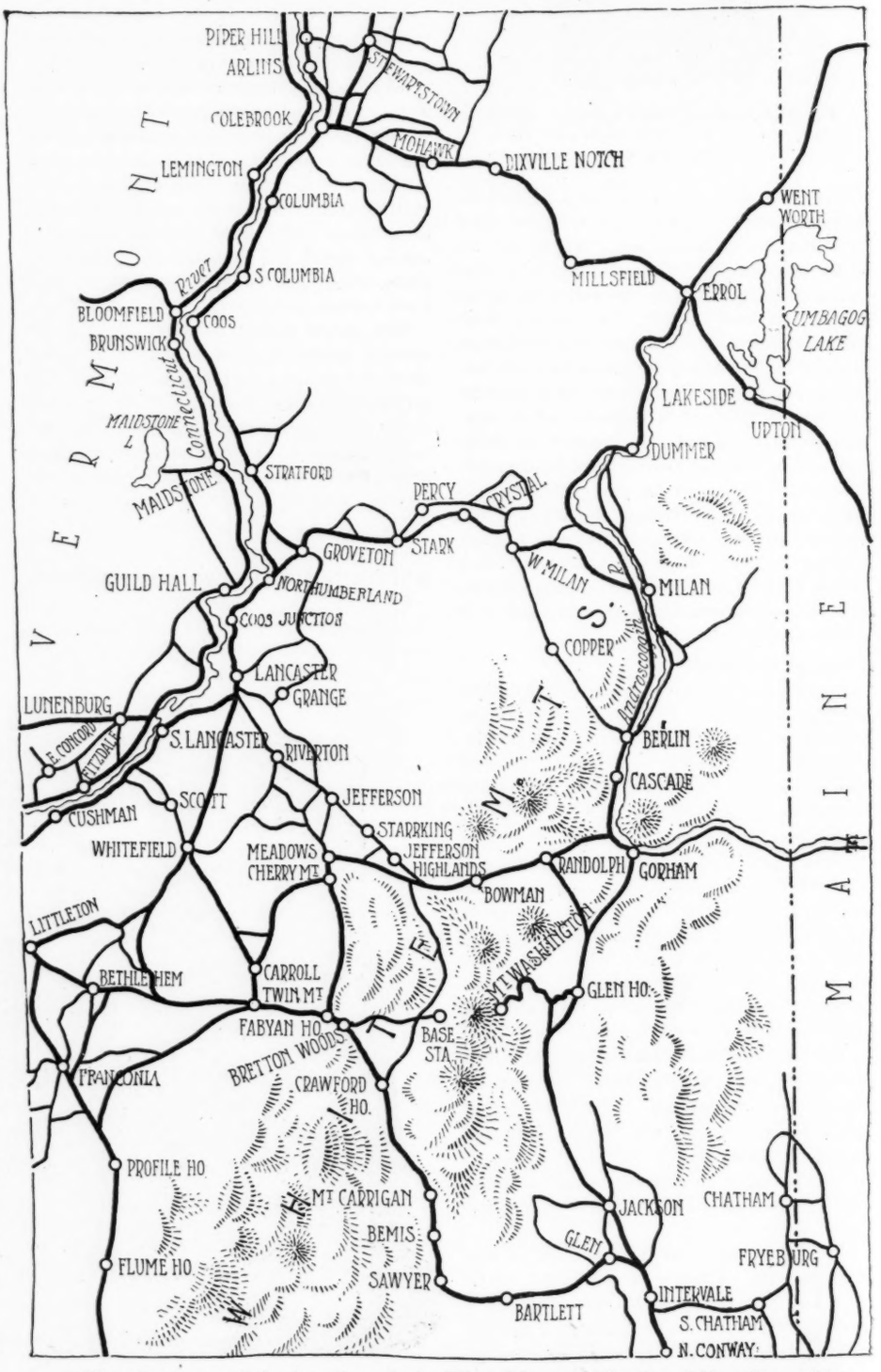
Bretton Woods the Terminus

Bretton Woods is made the terminus of nearly all the routes entering this section, solely as a matter of convenience and on account of its central location. However, Crawford House, Twin Mountain, Jefferson, Jackson, Gorham, Intervale, the Woodstocks, Franconia, Bethlehem, and last, yet preferred by many, the Profile House, share equally in advantages as a tourist center.

Much of the White Mountain district can be made in one circle tour. If the tourist is in the vicinity of Boston he would enter the district at North Conway and drive on through Intervale to Jackson, which is surrounded by the outlying spurs of the mountains. Several days may well be spent in the vicinity of Jackson if all the sequestered beauty spots are to be visited. Fishing and golfing are the principal sports at this point. From Jackson north the road follows the winding course of the Ellis river. Some distance to the north of Jackson the road leading to the top of Mount Washington branches off and here is a climb of 6000 or 7000 ft. that offers superb attractions. It should not be forgotton, however, that warm wraps are necessary for these mountain tours, even in midsummer, to guard against the chilly atmosphere of the higher levels where the temperature seldom rises above 50 deg. and the cold mountain mists sometimes cause discomfort.

Going north from the point where the Mount Washington road branches off, the road follows the Peabody river and is overshadowed by massive summits of the Presidential range—Mount Washington, Mount Clay, Mount Jefferson, perhaps the finest of all the White Mountains in its perfection of form and grandeur of outline, the three Adams peaks and Mount Madison. The road then circles the bulky form of Pine Mountain toward Gorham on the Androscoggin river. A short distance to the west of Gorham the Moose river is crossed and the road then leads up the picturesque Androscoggin valley through Berlin, Milan, Errol and Millsfield to Dixville Notch, which is 68 miles from Jackson.

Dixville Notch is a magnificant ravine in the Dixville mountains at the northern ex-



Map showing roads leading through the White Mountain district of New Hampshire

tremity of the White Mountain region. The region is famous for fishing and hunting and good hotel accommodations are available. Westward along the valley of the Mohawk river the road passed through Mohawk and along the base of Monadnock mountain, then swings south to Colebrook. Following the course of the Connecticut river, which forms the boundary between Vermont and New Hampshire, the road passes through Columbia, Coos and Stratford to Groveton, which lies in the midst of lofty hills.

From Groveton the road circles Mount Lyon and comes out on to a plain that runs through Northumberland and Coos Junction to Riverton and Jefferson, passing Mount Prospect on the west side. The distance from Dixville to Jefferson is 54 miles.

Jefferson is located on a spur of Starking Mountain, the most southerly summit of the Pilot range, where the view is perhaps the finest in the White Mountains. The drive from Jefferson to Bretton Woods is 18 miles and takes one through Meadows and Cherry Mountain.

Curious Features

From Bretton Woods the road lies west to Twin Mountain, where a turn is made to the south through the densely wooded uplands of the Franconia range, passing Mount Lafayette, whose lofty peak towers above the others of that vicinity like a monarch among his loyal lieges. The road threads its narrow way through the defile known as Franconia Notch. On the east of this road is Echo Lake, surrounded by towering peaks. Following the Pemigewasset river, the road passes Profile lake, the waters of which reflect the lights and shadows beneath a background of thickly wooded hills, while peering out over the lake is the solemn-faced "Old Man of the the Mountains," otherwise known as "The Great Stone Face."

The Flume, another curious freak, where the waters rush through rocky declivities, can be visited by a side road, which is marked. Motor cars are not admitted so the visitor must hire a carriage or walk.

Continuing south the road passes through almost unbroken forest and the expansive views of hill and valley, characteristic of the preceding portions of the route, are largely absent. From time to time, however, views are obtained of mountain tops to the right and left of the road. This virtually is the end of the White Mountains.

There are numerous short side excursions to be made from almost any point on this circle tour. It matters not which one, or how many are taken, each has its especial charm and beauty.

Good roads from almost any point in New England lead to this White Mountain district. This circle tour may be begun at almost any point, depending upon the direction from which the mountains are approached.

Answers to Inquiries for Route Information

Minneapolis, Minn.—Polson, Mont.

Minneapolis, Minn.—Editor MOTOR AGE—Inform me of the best route to Polson, on Flathead Lake, Mont.—Chas. H. Weber.

From Minneapolis, proceed to Excelsior, Victoria, Waconia, Young America, Norwood, Glencoe, Sumter, Brownton, Stewart, Buffalo Lake, Hector, Bird Island, Olivia, Montevideo, Milan, Appleton, Ortonville, Big Stone City, Millbank, Twin Brooks, Summit, Waubay, Webster, Bristol, Andover, Groton, Aberdeen, Ipswich, Bowdle, Java, Selby, Mobridge, Wakpela, McLaughlin, Tatanka, McIntosh, Watauga, Morristown, Thunder Hawk, Lemmon, Petrel, White Butte, Haynes, Hettinger, Bucyrus, Reeder, Gascoyne Bowman, Rhame, Marmarth, Baker, Plevna, Westmore, Ismay, Mildred, Fallon, Terry, Miles City, Hathaway, Rosebud, Forsyth, Custer, Pompeys Pillar, Huntley, Billings, Laurel, Park City, Columbus, Merrill, Big Timber, Hunters Hot Springs, Livingston, Bozeman, Belgrade, Manhattan, Old Three Forks, Three Forks, Cardwell, Whitehall, Butte, Rocker, Deer Lodge, Garrison, Drummond, Bearmouth, Bonita, Clinton, Missoula, Ravalli, St. Ignatius, Ronan, Polson.

Volume 5 of the 1916 Automobile Blue Book, published by the Blue Book Pub. Co., 910 South Michigan avenue, Chicago, contains complete running directions for this trip.

Fort Worth, Texas-Washington, D. C.

Fort Worth, Texas—Editor Motor Age.—Give route from here to Washington, D. C., passing through Memphis and Chattanooga.—H. B. Francis.

From Fort Worth proceed to Arlington, Dallas, Richardson, McKinney, Anna, Whitewright, Bonham, Dodd City, Windom, Honey Grove, Brookston, Paris, Sylvan, Blossom, Detroit, Clarksville, DeKalb, New Boston, Texarkana, Ark., Fulton, Hope, Emmet, Prescott, Boughton, Gurdon, Arkadelphia, Hot Springs, Lonesdale, Benton, Collegeville, Little Rock, Galloway, Lonoke, Prairie Center, Hazen, Clarendon, Brinkley, Forrest City, Madison, Memphis, Tenn., Raleigh, Bartlett, Ellendale, Arlington, Gallaway, Braden, Mason, Stanton, Brownsville, Harvey, Jackson, Rollins, Springcreek, Terry, Huntingdon, Camden, Tennessee River Ferry, Trotters Landing, Hustburg, Waverly, McEwen, Dickson, Charlotte, Dellburg, Pardue, Cumberland River Ferry, Ashland City, Bordeaux, Nashville, LaVergne, Jefferson, Walter Hill, Murfreesboro, Deason, Shelbyville, Bellville, Fayetteville, Tenn., Hazel Green, Ala., Meridianville, Huntsville, Ala., Brownsboro, Gurley, Paint Rock, Woodville, Larkinsville, Scottsboro, Bellfonte, Stevenson, Bridgeport, Ala., Richard City, Tenn., South Pittsburgh, Jasper, Rankins Ferry, Wauhatchie, Chattanooga, Ooltewah, Tucker Springs, Charleston, Calhoun, Athens, Niota, Sweetwater, Philadelphia, Tenn., Loudon, Lenoir City, Knoxville, Straw Plain, New Market, Jefferson City, Dandridge, Reedtown, Clevengertown, Wilsonville, Newport, Huckleberry, Wolf Creek, Tenn., Hot Springs, N. C., Duell Hill, Marshall, Mars Hills, Grantville, Weaverville, Asheville, Swannoa, Black Mountain, Ridge Crest, Old Fort, Marion, Bridgewater, Glen Alpine, Calvin, Morganton, Connellys Springs, Hildebrand, Hickory, Claremont, Catawba, Statesville, Cleveland, Salisbury, Spencer, Lexington, Thomasville, High Point, Jamestown, Greensboro, Burlington, Graham, Mebane, Hillsboro, Durham, Bragtown, Knapp of Reeds, Stem, Providence, Oxford, Stovall, Bullock, N. C., Clarksville, Boydton, Mecklenburg, Cochran, Dinwiddie, Petersburg, Manchester, Richmond, Va., Ashland, Bowling Green, Fredricksburg, Falmouth, Mountain View, Garrisonville, Dumfries, Occoquan, Lorton, Accotink, Alexandria, Washington, D. C.

Volumes 5 and 6 of the Automobile Blue Book, published by the Automobile Blue Book Pub. Co., 910 S. Michigan Ave., Chicago, contain complete running directions for this trip.

Columbia, S. C., to Minneapolis

Columbia, S. C.—Editor Motor Age—Give best routing from here through Washington to Minneapolis.—G. S. Heyward.

From Columbia, S. C., proceed to Pontiac, Blaney, Camden, Cassatt, Bethune, McBee, Patrick, Cheraw, Rockingham, N. C., Ellerbe Springs, Jackson Springs, West End, Pinehurst, Southern Pines, Cameron, Lemon Springs, Jonesboro, Lockville, Moncure, Haywood, Merry Oaks, Bonsal, Newhill, Apex, Cary, Method, Raleigh, Morrisville, Nelson, Durham, Hillsboro, Mebane, Graham, Burlington, Greensboro, Reidsville, Pelham, Stokesland, Va., Danville, New Design, Chatham, Hurt P. O., Alta Vista, Clarion, Lynchburg, Concord, Spout Spring, Appomattox, Evergreen, Pamplin, Prospect, Farmville, Burkeville, Nottoway, Blackstone, Wellville, Wilsons, Hebron, Sutherland, Petersburg, Manchester, Richmond, Ashland, Coatesville, Spotsylvania, Fredericksburg, Falmouth, Garrisonville, Dumfries, Occoquan, Accotink, Alexandria, Washington, D. C., Bethesda, Md., Rockville, Gaithersburg, Damascus, Ridgeville, Frederick, Boonsboro, Funkstown, Hagerstown, Clear Spring, Indian Spring, Hancock, Cumberland, Frostburg, Grantsville, Keysers Ridge, Addison, Pa., Somerfield, Farmington, Hopwood, Uniontown, Brownsville, West Brownsville, Centerville, Beallsville, Scenery Hill, Washington, Claysville, West Alexander, Elm Grove, W. Va., Wheeling, Bridgeport, O., Cambridge, Zanesville, Jacksontown, Newark, Granville, Columbus, Marblecliff Station, Dublin, Marysville, Zanesfield, Bellefontaine, Lima, Delphos, Van Wert, New Haven, Ind., Fort Wayne, Churubusco, Noblesville, South Bend, Columbia City, Pierceton, Warsaw, Atwood, Plymouth, Wanatah, Valparaiso, Chicago, Oak Park, Addison, Elgin, Algonquin, Crystal Lake, Ridgefield, Hebron, Lake Geneva, Wis., Elkhorn, Lauderdale Lakes, Eagle, Oconomowoc, Mayville, Theresa, Fond du Lac, Van Dyne, Oshkosh, Dale, Redfield, Fremont, Weyauwega, Waupaca, Amherst, Amherst Jct., Stevens Point, Auburndale, Marshfield, Specer, Unity, Abbottsford, Owen, Withee, Thorpe, Stanley, Chippewa Falls, Eau Claire, Menominee, Knapp, Baldwin, Roberts, Hudson, Lakeland, Minn., St. Paul, Minneapolis.

Vols. 6 and 4 of the Automobile Blue Book, published by the Automobile Blue Book Publishing Co., 910 S. Michigan Ave., Chicago, contain complete running directions for this trip. Price $3.00 each.

Abilene, Kans.—Lake Geneva, Wis.

Abilene, Kans.—Editor Motor Age—Give touring directions from here to Lake Geneva, Wis.—Rev. S. A. Chappell.

From Abilene proceed to Junction City, Manhattan, Wamego, St. Marys, Rossville, Silver Lake, Topeka, Horton, Everest, Troy, Wathena, St. Joseph, Mo., Avenue City, King City, Ford City, Albany, Bethany, Eagleville, Lamoni, Ia., Leon, Osceola, Medora, Indianola, Des Moines, Colfax, Newton, Kellogg, Grinnell, Brooklyn, Victor, Ladora, Marengo, South Amana, Oxford, Coralville, Iowa City, West Liberty, Moscow, Durant, Davenport, Moline, Watertown, Hillsdale, Erie, Galt, Sterling, Dixon, Grand Detour, Oregon, Byron, Rockford, Cherry Valley, Belvidere, Harvard, Ill., Walworth, Wis., Fontana, Lake Geneva.

Vols. 5 and 4 of the 1916 Automobile Blue Book, published by the Automobile Blue Book Pub. Co., 910 South Michigan avenue, Chicago, contain complete running directions for this trip.

Standard Specifications for 1½-Ton

New Requirements Are Issued as War Department Explains

WASHINGTON, D. C.—Editor MOTOR AGE.—*Herewith are specifications for 1½ and 3-ton motor trucks, for your information, and in this connection your attention is invited to the following: Referring to the specifications for 1½ and 3-ton motor trucks issued by the War Department, it is desired to state that these specifications were prepared by a special committee composed of officers of the various bureaus of the War Department interested in truck construction, and which have motor trucks in operation in connection with their field activities.*

The aid of the Society of Automobile Engineers was invoked for assistance in the preparation of these specifications, and the specifications were passed upon, after careful consideration, by the Truck Standards Division of the Society of Automobile Engineers, who rendered most valuable and basical assistance in the preparation of these specifications.

It is desired expressly to state that it is not intended that these specifications shall limit either the War Department or truck manufacturers to the production of trucks that meet in all particulars the requirements of these specifications. On the contrary, it is expected that trucks manufactured for military services will depart more

WASHINGTON, April 16—The Quartermaster General of the army has formally approved the specifications for army trucks recently agreed upon by representatives of his department and members of the Society of Automobile Engineers, thus paving the way for bids which will be asked for probably 40,000 such trucks. These will include both 1½- and 3-ton trucks. Officers of the quartermaster corps express confidence in a prompt and satisfactory response from

INTERCHANGEABILITY of Parts — All parts of truck must be constructed to definite standard dimensions, with proper tolerance and clearances, so that any part of same may be replaced and properly fitted and adjusted without requiring additional tool work or machine work on the parts.

Standard Parts—It is desired that as many parts of the truck as practicable be of standard design and constructed to standard dimensions, which will make them interchangeable with the same parts made by other manufacturers. It is also desired that these parts be constructed in accordance with S. A. E. standards.

Guarantee—Each bidder will be required to guarantee his vehicle or vehicles against defects in material or workmanship for a period of one year. This guarantee shall include the delivery of the defective part or parts to any point in the United States. After the installation of the new part, the defective part will be returned to the manufacturer if he so requests. The manufacturer will pay the transportation charges on all returned parts. The above guarantee shall also apply to all parts and accessories which are not made by the bidder.

DESCRIPTION

Load Capacity—The trucks must be of sufficient strength, and provided with sufficient power, to carry and propel the following gross load under the most severe service conditions:

Pay load	3000 lb.
Body	1050 "
Three men	525 "
Extra equipment	200 "
Total	4775 lb.

The extremely severe service conditions under which these trucks will be operated indicate that they should be designed for a nominal pay load of 4000 lb.

Load Distribution—The distribution of load between front and rear axles, with the normal pay load equally distributed in the standard truck bodies herein specified, shall be not less than 80 per cent or more than 95 per cent on the rear wheels in two-wheel drive trucks. In four-wheel drive trucks the total weight of the loaded vehicle shall be as equally divided as posible between the front and rear wheels.

Weight of Chassis—The maximum weight of chassis, without body or extra tool and parts equipment, and without gasoline, water or oil, must be not more than 6000 lb. A definite statement must be made showing exactly what equipment is included in the stated weight.

Road Speed—The governor on engine shall be set so as to give a road speed of 15 m.p.m., with a maximum governed engine piston speed of 1100 ft. a minute.

Type of Drive—The trucks may be provided with any suitable standard type of drive, such as internal gear, bevel gear, worm gear or chain drive. Preference will be given to that type of final drive which provides the greatest amount of ground clearance, in conjunction with provision for retaining grease or oil and excluding dirt.

Either two-wheel drive or four-wheel drive may be employed.

The following items are considered of vital importance:

Transmission—The transmission shall be of the selective sliding gear type, and must have not less than four speeds forward and one reverse, and must be installed as a seperate unit on a sub-frame between the engine and differential. It must be installed with a three-point mounting in order to prevent the distortion of frame from breaking the transmission legs. The high speed gear shall be direct without reduction in the transmission unless the truck is four-wheel drive.

The splined driving shaft for sliding gears must be made of best quality alloy steel, properly heat treated.

The low gear ration of transmission shall be suitable for giving a tractive factor of not less than .338, and the total low gear reduction of transmission and final drive shall be not less than 40 to 1.

The main drive shaft, and also the countershaft of transmission, must all be provided with ball or roller bearings of best make and suitable capacity. The use of plain bearings in the transmission assembly will not be permitted, except in the case of the revere gear. If the bearings are adjustable, the adjustment must be accomplished by the use of shims.

The transmission must be accessible from below the body for inspection, adjustment, removal, or repair. Transmission gears constructed as an integral part of the rear axle, or in any other manner which does not provide proper spring suspension, will not be acceptable.

Ground Clearance—The ground clearance at all parts of truck, except at drive sprockets and hub brake drums, shall be not less than 9¾ in. The ground clearance at the center of truck between front and rear wheels shall be not less than 18 in., and the difference between this center clearance and the axle clearance may be decreased in proportion to the distance from the center of the truck. The clearance under engine pan shall be not less than 11 in.

Wheelbase—The wheelbase must be suitable for the use of a 10-ft. body, and shall be not less than 124 in. or more than 150 in.

Turning Circle—The truck shall be so designed as to turn in a circle of not more than 55 ft., measured from outside wheel tracks. Positive stops must be provided to limit the steering angle of the steering wheels.

Gage—The gage of wheels on 1½-ton trucks, measured from center to center of felloe bands, shall be as follows:

4-in. single tires	58½ in.
6-in. single tires (used on 4-wheel drive)	60½ in.
7-in. single tires	61½ in.

ENGINE AND COOLING SYSTEM

Engine—The engine must be of the 4-cycle type, water-cooled, having not less than four cylinders, and provided with mechanically operated poppet valves. It shall have a total piston displacement of not less than 312 cu. in. and must develop a torque of not less than 2000 in.-lb. at not more than 1000 ft. of piston speed per minute. The torque at 500 ft. of piston speed per minute shall be not less than 90 per cent of the maximum torque. The engine must be under a removable hood, and located in a readily accessible position.

Cylinders—The cylinders shall be cast from best quality gray iron, and must be free from sand holes, blow holes, cold shuts or other imperfections. The bore of finished cylinders must be the same diameter from end to end, and finished to a tolerance of plus or minus .0005 in. for diameter and eccentricity.

Pistons—The pistons shall be designed and constructed in accordance with the best standard practice. They shall be light in weight, heavily ribbed to secure proper strength, and made of best quality gray cast iron, free from blow holes, sand holes, shifted core or other imperfections. They shall be properly annealed, machined with light cuts to avoid distortion and ground to a high finish, proper tolerance and a suitable clearance in cylinders.

The clearance between maximum diameter

and 3-Ton Gasoline Motor Trucks

Result of Special Committee's Work—Flexibility of Enforcement

or less from these specifications, depending upon the equipment of manufacturers and their facilities for varying their production to meet, where practicable, the major requirements of these specifications.

It is considered that the provisions of these specifications are desirable, in the light of experience so far had in the use of trucks in military operations in this country. They have been prepared in accordance with suggestions presented by engineers who have had opportunity to observe trucks in military operation under conditions which our armies in the field will encounter, and it is felt that the particular features covered in paragraph 20 are of major importance. It is especially pointed out that paragraph 18 specifically provides for such variations from the standard specifications as manufacturers may find it necessary to take advantage of.

The hope is that these specifications will be regarded by manufacturers as the final goal, the attainment of which is desired by the War Department in a military truck, and that it will be understood that the Government is not establishing a standard with a view to making arbitrary requirements in non-essentials.—HENRY G. SHARPE, Quartermaster General.

manufacturers of trucks when the bids are sent out, which is said will be about June 1.

The bids will be asked on the condition that the government may order the trucks in any quantities desired, not in excess of the maximum number stipulated. It is not anticipated that the first orders will be for an exceptionally large number, these orders depending entirely upon the rapidity with which the various units of the new army are organized.

---

of piston and the diameter of cylinder bore shall not be less than .003 in. or more than .005 in. They shall be properly tapered or relieved at the head end to provide for expansion, and shall have an internal stiffening flange at the open end.

Piston Pins—The piston pins shall be hollow, with a wall of proper thickness. They shall be made of steel of suitable quality for the purpose, properly hardened, and ground to a high finish and proper tolerance. The harness of piston pins shall not be less than 470 Brinell, as a base for comparative scleroscope readings.

Piston Rings and Grooves—The piston shall be provided with at least three ring grooves of proper width and depth, all located between the wrist pin and the head end of piston. These grooves shall be ground to a high finish at the sides. Piston ring grooves to be finished in accordance with S. A. E. practice.

If the triple type of ring is used, having one internal ring and two external rings, two ring grooves may be used, each provided with a triple ring, or one groove may be provided with a triple ring and the other with the ordinary type of single ring.

The single rings shall be machined to a high finish and proper tolerance on outside periphery, and ground on sides in accordance with S. A. E. recommended practice.

Valves—The intake valves and exhaust valves must be interchangeable and made of alloy steel of best quality for the purpose.

The complete composition of the steel must be stated definitely, and all valves must be heat treated to develop the proper physical properties.

The valves must be constructed of one piece for both stem and head, must have a large radius fillet between the stem and head and must be provided with 45 deg. seats.

All parts of valve mechanism must be completely inclosed. If the engine is of the L-head or T-head type, the valve springs, stems, and tappets must be inclosed by a suitable readily removable cover plate, and if the engine is of the valve-in-head type, the overhead valve mechanism must be completely inclosed with a suitable readily removable cover, or the bearings for rocker arms must be provided with suitable felt washers to prevent the entrance of dust or dirt.

Connecting Rods—The connecting rods shall be of I-beam section, drop forged from steel equal to S. A. E. steel No. 1035, and properly heat treated. The crank end of the connecting rods shall be provided with bronze bushings faced with a proper thickness of best quality bearing metal. These bearings shall be scraped to a proper fit with the crank, and in proper alignment at all positions of the crank, and for two-bolt rods shall be held in place with suitable doweling. The bearing shall be provided with proper grooves and oil holes for lubrication. The bearing on piston pin shall be in the connecting rod end, and a suitable solid phosphor bronze bushing pressed in, shall be used.

Crankshaft—The crankshaft shall be forged from a single piece of steel, equal in quality to S. A. E. specifications No. 1045, and heat treated to develop the following minimum physical properties:

Brinell hardness, 250-275 (scleroscope 41-45).
Reduction of area, 45 per cent.
Elongation, 16 per cent in 2 in.

The crankshaft shall be sufficiently large in section at all points to prevent objectionable torsional or lateral vibration at all practicable engine speeds and loads. Both crank bearings and main bearings shall be large in area in order to give low bearing pressures and long bearing life without replacement or adjustment. The crankshaft shall have not less than three main bearings for a four-cylinder engine. The crank pins and main bearings of crankshaft must be ground to a high finish and a total tolerance of .0005 in. for eccentricity, and a tolerance of plus or minus .0005 in. for diameter. The crankshaft must be accurately balanced for static and running balance, at the governed speed of the engine.

The flywheel flange must be forged integral with the crankshaft. This flange must be large in diameter and so designed as to secure an accurate centering of the flywheel on the flange.

Crankcase—The crankcase is to be divided in a horizontal plane, with all bearings in the upper section. It must be so designed as to be light in weight and also of proper strength, and must be provided with suitable ribbing in order to secure a strong case free from distortion or weakness, and without excessive weight. It should be so designed as to permit any piston to be removed from its cylinder and taken out of the case without removing the cylinder or crankshaft.

All oiling receptacles, pipes and oil guides, except the constant level troughs for connecting rods, shall be either pressed or cast integral with the crankcase, or the oil pipes may consist of external leads. If external leads are used, they shall be short and rigid, or properly clipped to prevent vibration and chafing.

The crankcase must also be provided with an effective oil level indicating device, of the bayonet blade type.

The crankcase must be a smooth casting, free from defects of material, design or construction.

All joints or connections in crank case shall be made thoroughly oil tight.

Oil Capacity—The oil reservoir of engine must have sufficient capacity for lubricating oil to permit the truck to run fully loaded a distance of not less than 200 miles over ordinary roads without replenishing the supply of oil.

Lubricating System—The engine shall be lubricated by a pressure oiling system. The oil pump must be positive driven and provided with suitable screens of not less than 30 mesh, and which are readily removable for cleaning. It is desirable that the oil pump and screens be so arranged as to make the screens self-cleaning by an intermittent reverse flow of oil. The inlet to oil pump must be a sufficient distance above the bottom of oil reservoir to provide a suitable settling chamber.

The oil pump must deliver a large volume of oil, and must maintain a pressure of not less than 30 lbs. per sq. in. at an engine speed of 800 r.p.m. A suitable relief valve on the oiling system must be provided.

Frictional Horsepower—The engines furnished with trucks must be thoroughly "run-in," so that the trucks may immediately after delivery be placed in continuous severe service without danger of damage to the engines. When the trucks are delivered the engines must be in such condition that the power required to drive any engine at 1000 ft. of piston speed, and with the fan and pumps in operation, shall not exceed 18 per cent of the rated horsepower of the engine with wide open throttle at the same speed.

Suspension—The engine must be mounted with a three-point suspension, or on a subframe having a suitable three-point suspension, which will effectively prevent the distortion of the frame from straining any part of the engine, clutch, or transmission.

Governor—A centrifugal type engine speed limiting governor of approved make shall be provided and adjusted so as to prevent the truck from exceeding a speed of 15 m.p.h. on high gear. The governor shall be adjustable and must have provision for sealing the ad-

justment and all connections of drive shaft with suitable lead seals.

Engine Shield—Suitable means must be provided to protect the carbureter, magneto and generator from water and mud. If a removable shield is used it must be fastened by means of spring clips which will permit it to be removed with the hands only and without tools of any kind. In case the engine crank case is provided with cast or stamped webs equally as effective as the engine shield herein described, the engine shield will not be required.

Carbureter—The carbureter must be of such design, and provided with such heating devices, as will enable it to utilize gasoline having an initial boiling-off temperature of not less than 122 deg. F., a 25 per cent boiling-off temperature of not less than 230 deg. F., a 50 per cent boiling-off temperature of not less than 300 deg. F., a 90 per cent boiling-off temperature of not less than 350 deg. F., and a dry point temperature of not less than 400 deg. F. The engine must utilize gasoline of the grade mentioned and at the same time operate with satisfactory economy and regularity at all engine speeds and loads.

A metal partition shall be installed on the inside of tank of such height as to give a capacity of 6 gal. on each side of the partition. Suitable baffle plates shall be installed on each side of partition in order to prevent excessive splashing. The connection from tank to carbureter shall be made from the bottom of each compartment, through a three-way cock, thus giving a positive reserve supply of 6 gal. A readily accessible shut-off valve shall also be provided in the gasoline supply line to carbureter.

The radiator shall be of the fin and tube type, having cast or pressed upper and lower headers, with bolted-on cooling section or sections. If the cooling section consists of individual tubes with fins, the tubes must be not less than ⅝-in. outside diameter. If the fins are continuous, the tubes may be a minimum of one-fourth inch in diameter. The overflow pipe must be of copper or brass, and not smaller than ⅝-in. tubing.

Starting Motor—Suitable provision must be made either on the engine or elsewhere, for the installation of a starting motor, of proper size and design. The starting motor is not to be furnished, but the truck must be so arranged as to readily permit of its installation at any time if so desired. The flywheel must be provided with gear teeth for use with the starting motor. These gear teeth must be cut in accordance with S. A. E. recommended practice.

Electric Lighting and Ignition—The truck must be provided with a suitable electric lighting system and dual ignition system. The electric lighting system shall consist of a generator driven from the powerplant, a reverse current voltage cut-out, 100 amp. hr., 3 cell, lead acid battery, or 75 amp. hr. 5 cell nickel-steel alkali battery, electric lights, fuses, wiring and other necessary details. The ignition system shall consist of a high tension magneto of best make and a battery and coil ignition system. One distributer and one set of spark plugs may be used in common with the two separate ignition systems. The current for battery ignition will be taken from the electric lighting battery. Both battery ignition and magneto must be readily controlled from the driver's seat, and the spark advance lever on steering wheel must control both ignition systems and give a suitable degree of spark advance for all positions of the spark advance lever. The range of spark advance shall not be less than 30 deg. of crank angularity. The full retard position of the spark lever shall retard the battery spark at least 3 deg. after top center.

Generator—The generator shall be of the fully inclosed direct current, constant voltage type, and must have a continuous capacity of 12 amp. The voltage of the generator when installed on the truck shall be 8 volts at 1 amp., and 7 volts at 12 amp., within limits of plus or minus .2 volt. The voltage regulation must be the same with varying engine speeds, up to governed engine speed. It must be driven from the engine by means of suitable gears or silent chain drive. The gears or silent chain drive must be completely inclosed, thoroughly lubricated and effectively protected from dust and dirt. If driven by means of silent chain drive, the chain must be readily adjusted. Definite data in reference to the material and construction of chain or gears must be given.

High Tension Magneto—A high tension magneto of best make must be installed on the engine and positively driven either by gears or by a silent chain drive. If driven by gears, the gears must run in oil, and if driven by silent chain drive, the chain must be readily adjustable. In either case the chain or gears must be completely inclosed and thoroughly lubricated. The magneto must be arranged for clockwise rotation. Both the magneto and the mounting for same must be constructed in accordance with S. A. E. recommended practice.

Lighting Equipment—The truck shall be provided with the following lighting equipment:

1—Searchlight, with quick-acting vertical and horizontal adjustment, silver plated brass or copper parabolic reflector, or glass parabolic reflector silvered on the back, with 21-c.p. tungsten focusing bulb.

CHAMPION SPARK PLUG IN CANADA

Toledo, Ohio, April 13—Business during the last year for the Champion spark Plug Co. in Canada increased more than 200 per cent, and as a result the Champion Spark Plug Co., Ltd., of Canada has been organized with a capital of $100,000, and a branch has been opened at Windsor, Ont.

REPUBLIC TRUCK IN WEST

Los Angeles, April 13 — The Republic Motor Truck Co., Alma, Mich., is seeking a site here for the erection of an assembly plant. Announcement to this effect has been made by D. F. Poyer, manager of the company's local branch and a stockholder in the organization. Mr. Poyer said to-day that it is planned to build 2000 trucks here the first year of the plant's operaton. About 125 mechanics will be employed at the start.

INAUGURATES SERVICE GIFT PLAN

Detroit, April 14 — The Studebaker Corp. of America plans to make special anniversary gifts at the end of each year of service to employes who on and after Jan. 1, 1917, have been with the company for two or more continuous years. Under the plan all employes, regardless of age, position or sex, excepting those whose salaries are $2,000 or more a year or who receive pensions, will receive annually an anniversary check amounting to from 2 to 10 per cent of their earnings for the year ended. Continuous service is necessary to make workers eligible for the gift. Absence of thirty days or less, due to sickness, vocations, shut-downs or inventories will not be regarded as interruptions of continuous service.

2—Side lamps, combination oil and electric, with 8-c.p., 6-8 volt tungsten bulbs.

1—Electric instrument lamp, with 2-c.p., 4-volt bulb, and one combination oil and electric tail lamp with 2-c.p. bulb, connected in series.

1—Portable trouble lamp, 8-c.p., with cord, and plug with seperate socket.

1—Ammeter of best make, for indicating the charge and discharge of battery.

FRAME AND BODY

Frame—The frame shall be constructed of pressed steel or standard rolled structural sections. The frame and suspension must be so designed as to prevent cramping of any part, due to distortion of frame because of uneven road condition.

The distance from the back of the driver's seat to the rear end of frame shall be 10 ft. This frame length will permit of sufficient overhang of body to allow the installation of towing hooks and rear bumpers.

The frame shall be reinforced at proper intervals with suitable cross members thoroughly fastened to the frame with hot rivets or fitted bolts riveted over nuts. All holes in the frame shall be drilled, not punched. A suitable towing hook shall be attached to each side of the front end of frame. These towing hooks may be installed on the front bumper.

Steering Connections—The steering knuckle tie rod, steering kunckle arms and steering gear connecting rod must be located back of the axle in order that the front axle may protect them against damage from obstructions. The steering kunckle tie rod must be straight from end to end, and located as far above the lower edge of axle as possible and entirely protected by the axle from spring seat to spring seat.

Location of Control—The gearshift and hand brake levers must be placed at the driver's right, with the hand brake lever to the right of the gearshift lever. The hand brake lever is to be pulled back for brake application. The gearshift lever must be fitted with a latch guarding the reverse position.

Gearshift Lever Handle Positions—The gearshift lever handle positions shall be as follows:

First speed—Forward and left.
Second speed—Rear and left.
Third speed—Forward and right.
Fourth speed—Rear and right.
Reverse—Guarded by a latch in separate gate. Extreme left through neutral, then forward.

Clutch and Brake Pedal—The clutch pedal should be located to the left, and the foot brake pedal to the right, of the fore and aft center line of the steering column.

Accelerator Pedal—The accelerator pedal shall be placed to the right of the brake.

TRANSMISSION AND RUNNING GEAR

Clutch—The clutch may be either dry multiple disk or dry single disk type, having one series of plates faced with wire asbestos friction material. It must be of suitable design for transmitting the maximum torque of the engine without slipping, must be easily accessible for repair or replacement of parts and must be provided with a suitable arrangement for permitting easy engagement which will not require frequent adjustment or renewal of friction material.

Flanges must be fitted on the clutch pedal in order to prevent the driver's feet from slipping off of same. The pressure on the clutch pedal pad necessary to disengage the clutch must be not more than 90 lb. or less than 70 lb.

Transmission Drive Shaft—The transmission drive shaft, connecting clutch with transmission, must be provided with two universal joints of the lubricated bearing type. The fabric type of joint will not be acceptable. The joints must be entirely inclosed and means provided for suitable lubrication and for retaining the lubricant in the joint. Pro-

vision must be made to prevent the shaft whipping loose in the event of joint failure.

Two universals must be provided between the transmission and differential. These universal joints must be so designed as to contain a proper quantity of lubricating grease and must each be provided with a tight leather boot made of best quality, first cut leather. The use of fabric universal joints will not be permitted.

Drive Axle—The trucks may be either internal gear drive, chain drive, worm gear drive or double reduction gear in a central housing. The driving axle may be either full floating or semi-floating type.

The design, material and construction of the drive axle and final drive shall be in every respect in accordance with the best standard practice.

Differential—The differential shall be of such a type as to automatically permit the wheels to revolve at different speeds without complete loss of torque on either wheel, and also to apply at least normal torque to whichever wheel shall have traction. These requirements shall be met when the vehicle is running either forward or backward.

It shall consist of a forged steel or cast steel case, to which the large gear is attached by being bolted or riveted. This case shall also contain the necessary gears for producing the required differential action and shall be provided with suitable steel roller or ball bearings of best make. The case shall be supported on its bearings independent of the drive shaft ends. The drive shaft ends shall be properly fitted and connected by means of suitable splines to the gears in differential case. The spline connection shall be made in accordance with S. A. E. standards.

The bevel drive pinion shall be forged integral with its shaft. This shaft shall be made of steel equal to S. A. E. specification No. X3335, properly heat treated, and provided with two sets of taper roller or ball bearings of best make and suitable means for the ready adjustment of the bevel driving pinion in relation to the large driven gear, and vice versa. If ball bearings are used, suitable means shall be provided to take care of thrust loads.

Worm or Bevel Gear Drive—If the rear axle is of the worm or bevel gear driven type, it may be a built-up structure using steel tubes pressed or shrunk into a properly ribbed cast steel or malleable iron axle housing, or a suitable one-piece cast steel or malleable iron axle housing may be used without any steel tubes. Truss rods may be used at the discretion of the constructor, but the factor of safety of the rear axle load carrying assembly or member must be large enough to preclude any likelihood of breakage under the most severe service conditions.

Internal Gear Drive—If the final drive is an internal gear, provision must be made for entirely inclosing the driving gears and for retaining the lubricating oil or grease and for preventing same from getting onto the brake bands.

Brakes—Two independent sets of double acting brakes shall be provided. The emergency brake must act directly on the rear wheels and be operated by a hand lever with ratchet. Service brakes may act directly on the rear wheels or on the drive shaft and must be operated by a pedal. Brakes must be lined with an approved friction material and must be so constructed that they may be readily adjusted and securely locked in adjustment without removing the wheels or other parts.

Suitable flanges must be fitted on the brake pedal to prevent the driver's foot from slipping off of same.

Brake rods are to be sufficiently stiff or so supported as to prevent whipping or rattling.

Brakes must be sufficiently powerful either to slip the wheels or stop the truck within a distance of not more than 50 ft. with either the service brakes or the emergency brakes, when the normally loaded truck is running on a level, hard and dry macadam road at a speed of 15 m.p.h.

The service brakes may act directly on the drive wheel, brake drums, or on the driving axle next to the propeller shaft.

Brake adjustments must be readily accessible and must be adjustable without the use of special tools. All brake clevises, pins, or other bearings in brake rods or brake connection must be provided with bronze bushings.

The design of brakes and brake connections must be such that the application of drive wheel brakes is not affected by relative movement betwen the frame and axle.

All brakes must be mounted in such a manner that the braking strains will be taken by parts which are strong enough to withstand these strains under the most severe braking conditions.

Wheels—The wheels shall be of suitable size for the use of 36-in. S. A. E. demountable solid tires, and shall be best quality cast steel wheels, of proper design, strength and construction, and made in accordance with the best standard practice.

The wheels shall be of suitable size and design for the use of 36 by 4 single, solid S. A. E. demountable rubber tires on front wheels, and 36 by 7 single, solid S. A. E. demountable tires on rear wheels. All wheels shall be of proper strength to resist the vertical and lateral loads in the most severe service, and with the maximum load and speeds for which the truck was constructed.

HARROUN FACTORY RECEIVES

Detroit, April 13—An informal reception to celebrate the completion and equipment of the new Harroun Motors Corp. plant at Wayne was held April 11. Special interurban cars took the visitors to the plant from the general offices and back.

MAXWELL GASOLINE ECONOMY

San Diego, Cal., April 10—A Maxwell touring car which had been used in a fleet of mountain stage coaches operating in southern California for more than two years has just made a new record of 46.5 miles with a gallon of gasoline. About thirty Maxwell dealers competed for a cup which was offered for the best showing. The winning car was driven by Clarence Bradshaw, San Diego, who carried two official observers according to the rules. Every car entered was a stock model. The car that won had been traded in at the San Diego agency, the Lord Motor Car Co., a few days before the run.

BODY MAKER TO REBUILD

Indianapolis, Ind., April 16—W. B. Ansted, president of the Central Mfg. Co., Connersville, Ind., body manufacturer, whose plant was destroyed by fire two weeks ago, announced to-day that production has not been stopped. Contracts have been let for a new building. In the meantime the company is manufacturing bodies at the plant of the Rex Mfg. Co. and the Connersville Industrial Building. The loss was $150,000.

A new plant will be erected. It will be larger than the plant which was destroyed.

Tires—On two-wheel drive trucks the tires shall be 36 by 7 single tires on rear wheels, and 36 by 4 single tires on front wheels, both front and rear tires demountable.

On four-wheel drive trucks the tires shall be 36 by 6 single, demountable, both front and rear.

Hub Odometer—A hub odometer of best make, and of suitable design and construction for most satisfactory use on motor trucks, shall be provided and installed on one of the front wheels. This odometer shall have not less than five figures in the dial, and provision shall be made to prevent leakage of grease into mechanism.

SPRINGS

Springs—The chassis spring suspension must be of such design and construction as to relieve the body and chassis above springs of excessive vibration when the vehicle is traveling empty or partially loaded over rough surfaces at maximum speed.

SPECIFICATIONS FOR 3-TON TRUCKS

The specifications for 1½-ton trucks shall apply in the furnishing of 3-ton trucks, except as follows:

Load Capacity—The trucks must be of sufficient strength, and provided with sufficient power, to carry and propel the following gross load under the most severe service conditions:

Pay load	6000 lb.
Body	1500 "
Three men	525 "
Extra equipment	200 "
	8225 lb.

The extremely severe service conditions under which these trucks will be operated indicate that they should be designed for a nominal pay load of 7000 to 8000 lb.

Weight of Chassis—The maximum weight of chassis, without body or extra tool and parts equipment, and without gasoline, water, or oil, must be not more than 8000 lb. A definite statement must be made showing exactly what equipment is included in the stated weight.

Wheelbase—The wheelbase must be suitable for the use of a 12-ft. body, and shall be not less than 124 in. or more than 156 in.

Gage—The gage of wheels on 3-ton trucks, measured from center to center of felloe bands, shall be as follows:

5-in. single front tires	59½ to 64½ in.
5-in. dual rear tires	64½ in.

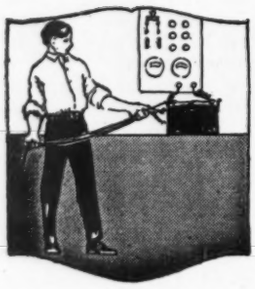
Engine—The engine must be of the 4-cycle type, water cooled, having not less than four cylinders, and provided with mechanically operated poppet valves. It shall have a total piston displacement of not less than 414 cu. in. and must develop a torque of not less than 2475 in.-lbs. at not more than 1000 ft. of piston speed per minute. The torque at 500 ft. of piston speed per minute shall be not less than 90 per cent of the maximum torque.

The distance from the back of the driver's seat to the rear end of frame shall be 11 ft. 11 in. This frame length will permit of sufficient overhang of body to allow the installation of towing hooks and rear bumpers.

The low gear ratio of transmission shall be suitable for giving a tractive factor of not less than .338, and the total low gear reduction of transmission and final drive shall be not less than 50 to 1.

The wheels shall be of suitable size and design for the use of 36 by 5 single, solid S. A. E. demountable rubber tires on front wheels, and 36 by 5 dual, solid S. A. E. demountable tires on rear wheels. All wheels shall be of proper strength to resist the vertical and lateral loads in the most severe service, and with the maximum load and speeds for which the truck was constructed.

Tires—On two-wheel drive trucks the tires shall be 36 by 5 dual tires on rear wheels, and 36 by 5 single tires on front wheels, both front and rear tires demountable.



Electrical Equipment of the Motor Car

By David Penn Moreton & Darwin S. Hatch.

Editor'' Note—Herewith is presented the thirty-ninth installment of a weekly series of articles begun in MOTOR AGE *issue of June 29 designed to give the motorist the knowledge necessary to enable him to care for and repair any and all of the electrical features of his car, no matter what make or model it may be. At the conclusion of this series, ''Electrical Equipment of the Motor Car,'' with additions, will be published in book form by the Class Journal Co., Chicago, in a size to fit the pocket conveniently.*

The fundamentals of electrical circuits of the motor car were explained through their analogy to water systems, and the relations of current pressure and resistance were brought out. This was followed by an explanation of series and multiple circuits, how electricity is made to do work in lighting, starting, signalling, etc. Calculating the capacity of a batery for starting and lighting and the cost of charging storage batteries and determining the torque a starting motor must develop were explained. Action of primary batteries and dry cells was considered. A section was devoted to the makeup and action of lead and Edison storage bateries, and another to the care of lead batteries in service and the best methods of charging them. Magnets and electromagnetism then were considered, and the principles of generators and motors explained. A section on generator output was followed by one on the purpose and operation of the cutout. The section on Engine and Motor Connection begun March 1 and was preceded by one on Electric Motors.

Part XXXIX—Motor and Engine Connection—Gear Housings

GEAR housings are of numerous, different forms, ranging from a very open or exposed type to the completely inclosed type. In some cases this housing is provided by the engine manufacturer with the definite requirements of a particular starting and lighting system in mind, and in such cases the completed installation has a very compact and finished appearance. In other cases the gear housings are provided by the manufacturer of the electrical equipment and so designed that they may be readily mounted on the engine. No general rule is followed in this connection, which results in a very wide variation in the appearance and construction of the various different systems. An example of an inclosed type of motor, or generator, gear housing is shown in Fig. 229.

Gear Reductions

There are quite a number of different methods of bringing about the proper speed relation between the motor and generator and the engine. This may be accomplished by a belt, by chain alone or in combination with gears, by a worm-and-worm gear, by the ordinary spur gear, by a planetary gear, etc.

A gear reduction in which the gearing is supplied by the manufacturer of the electrical equipment is shown in Fig. 230.

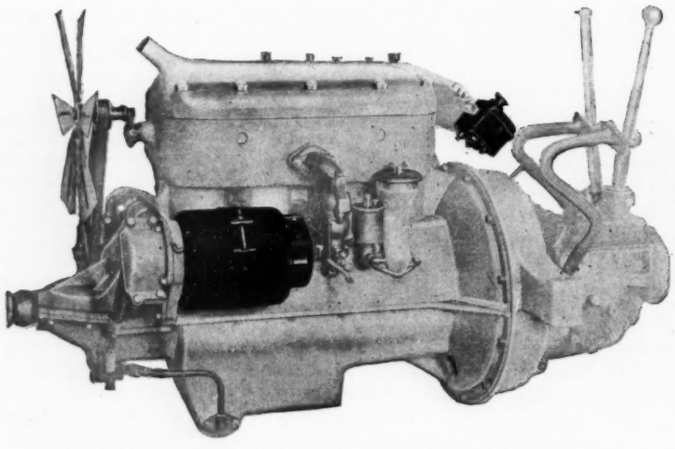


Fig. 229—Inclosed gear housing as used with the Northeast system on a Dodge Bros. car.

The gear reduction shown in Fig 231 is used by the Westinghouse Electrical & Mfg. Co. The small pinion on the end of the armature shaft meshes with three gears mounted on studs carried

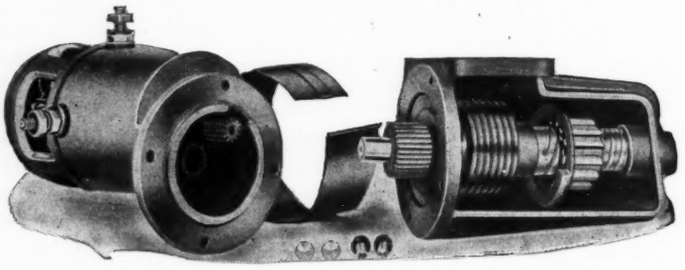


Fig. 230—Gear reduction in which the gearing is supplied by the maker of the electrical equipment

on a plate, which in turn is mounted on a shaft extending through the end of the motor housing. The three gears also mesh with teeth cut on the inside surface of the motor housing as shown in the figure. When the pinion on the end of the motor shaft rotates it causes the three gears to rotate and they in turn travel around the inside of the motor housing, carrying the plate on which they are mounted with them, and hence the shaft extending through the motor housing will rotate but at a much lower speed than the shaft of the motor.

A somewhat similar construction to the preceding is employed by the Wagner company, and an exploded view of their connection is shown in Fig. 230. The construction of this device is such that

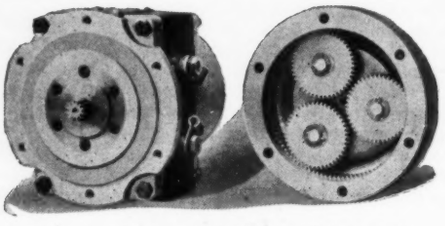


Fig. 231—Gear reduction used on Westinghouse starting motors

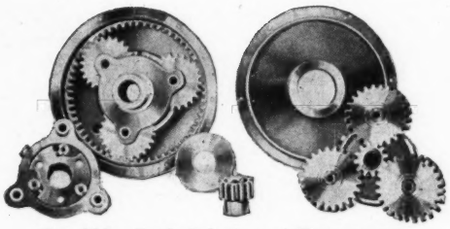


Fig. 232—Exploded view of Wagner gear connecting dynamotor to the engine

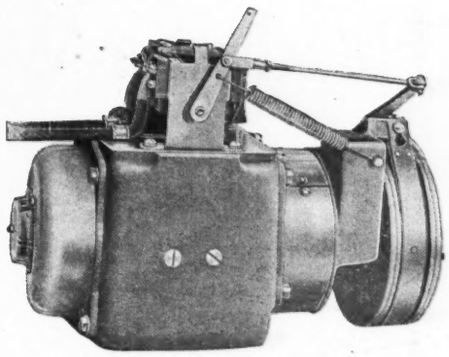


Fig. 233—Complete Wagner dynamotor, an exploded view of whose connection was shown in the preceding figure

power is transmitted from the starting motor to the engine through the planetary gears when a brake band controlled by a lever on top of the starting holds the gear housing stationary. The complete device is shown in Fig. 233. When the gear housing is free to turn and the engine speeds up the armature of the dynamotor is driven by the overrunning roller clutch. This combination allows the armature to operate at a higher speed in relation to the engine speed when the dynamotor is acting as a motor than it does when the dynamotor is being driven by the engine or when the dynamotor is acting as a generator would operate.

RUSSIA ORDERS 400 TRUCKS

Wichita Falls, Tex., April 13—The Wichita Falls Motor Co. has received an order from the Russian government for 400 motor trucks, which will be manufactured at the company's plant here. The trucks are to be delivered this year. It is reported that the company contemplates building a branch manufacturing plant at Dallas.

DEALER BUYS FREIGHT CARS

Chicago, April 13—The acute shortage of freight cars has resulted in a rather unusual organization in Chicago, the Tennant Oakland Transportation Co. With its formation a dealer becomes the owner of railroad equipment in company with the meat packer and the fruit grower, who for a long time have owned their own freight cars to make prompt shipments of perishable goods possible. In the dealer's case it is different in that his shipment is not of perishable goods but of motor cars. He has the added advantage, however, in that the schedules available for perishable goods are available for his goods.

The transportation company has started with enough freight cars to insure a steady stream of Oaklands into the Chicago agency, the Tennant Oakland Co. The initial order was for forty, and since the declaration of war with Germany this number has been increased to fifty-five. The photograph shows some of the freight cars loaded at the factory at Pontiac, Mich., ready for the freight engine. The cars run in sections, and each section will make six round trips a month.

5,000,000 LAMP ORDER

Cincinnati, Ohio, April 13—The Corcoran-Victor Co. has received an order for 5,000,000 lamps from the Ford Motor Co., Detroit, to be delivered between July, 1917, and July, 1918.

Manufacturers' Communications

Editor MOTOR AGE: We would appreciate your assistance in correcting an erroneous report which has appeared in several newspapers and different publications, in which it has been reported that the Inter-State Motor Co. has purchased the Beaver Mfg. Co., Milwaukee, Wis., and that the Inter-State Motor Co. is building their own motors in said plants. We would appreciate your correcting this report by stating that the Inter-State Motor Co. has not purchased the Beaver Mfg. Co., but has made arrangements to take over the entire output of the Beaver company for the coming year.—Inter-State Motor Co., Muncie, Ind.

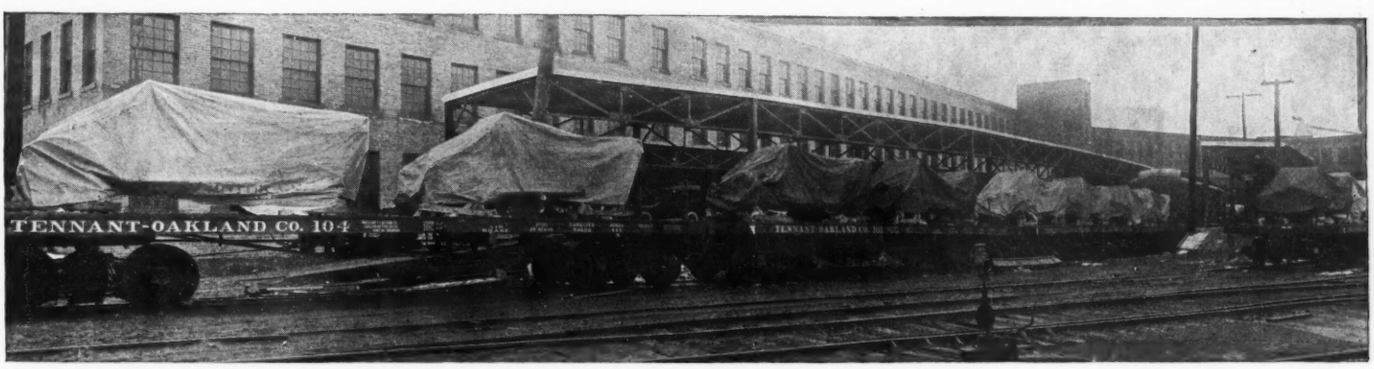
STUDEBAKER MAKES CHANGES

South Bend, Ind., April 13—C. S. Connor, formerly assistant manager of the Chicago Studebaker branch, has been appointed manager of the Omaha branch. J. K. Leander, salesman of the Chicago branch, has taken Mr. Connor's place as assistant manager. R. D. Maxwell, who has been manager of the Los Angeles branch, has taken over the territory in and around Birmingham, Ala., and in the future will be the Studebaker dealer in that territory.

F. N. Morgan, formerly wholesale salesman and special commercial car representative, has been appointed assistant manager of the St. Louis branch. Benjamin Hanger is now the Studebaker dealer in New Haven, Conn. Mr. Hanger left the position of assistant manager of the Boston branch to take over this territory. R. J. Miller, who takes his place as assistant manager of the Boston branch, was manager of the E. R. Benson Motor Car Co., Portland, Me.

METZ PLACES FOREIGN AGENCY

Waltham, Mass., April 13—The Metz Motor Co. has closed with Charles H. Hansen at Rio de Janerio, one of the largest dealers in South America, to handle the Metz car in Brazil. An initial order for fifty cars was received this week, and they will be shipped from New York soon.



Freight cars loaded at the Oakland factory with shipment for agency in Chicago. The Tennant-Oakland Co. has ordered fifty-five freight cars

Ready for War Call

Motor Schools and Classes Prepare—Feminine Auxiliaries to Aid U. S.

CHICAGO, April 13—Chicago is deeply immersed in the work of recruiting just now, and none of the city's people are more engrossed than the women of the I-Will city. These feminine adherents of the war god's cause logically are associated with the motor car very often in doing their bit to increase the nation's army and navy, for it is the motor car that has opened to the woman of to-day an extended opportunity for war service through the wide field of motoring.

As much as modern warfare has come to include the motor vehicle in its pursuit and successful engagement the woman has come to include it even more in those activities to which she lends a hand. She has welcomed the car as a broadening of the sphere of her usefulness, and it is a sphere that she is constantly seeking to cultivate during these days of martial atmosphere.

It is in the large city that motor and feminine combinations are most apparent, due no doubt, as you might remind me, to the larger number of such, population and so on. That may be so. In addition, however, there is that fellow feeling that urges on co-operation, and in the motor and feminine combination it is especially manifest.

This afternoon it seems as if all Chicago were drilling. Get on the car and go down motor row. In one block a squad of soldiers—new recruits, probably—is drilling, ing, while small boys look on with envious eyes at the khaki and "hay-foot, straw-foot." In the next block a class of women is receiving instruction in the care and repair of the motor car from one of the dealers on the row. Keep on and you will see other soldiers on Michigan avenue, part of which is Chicago's motor row, with a car now and then loaded with khaki-clad women and men, with urgent banners on the side.

From the Woman's Viewpoint

The woman's motoring branch of the Navy League has gone in for motor service during the war in earnest. Not long ago more than fifty of them passed a test in driving to prove their ability to give efficient service of this kind. The test was supervised by a representative of the Government from the Great Lakes Naval Station and W. G. Tennant of the Tennant Oakland Co., Chicago. These women did not rest content with the knowledge which made it possible for them to pass the test, however. They are still studying, and it is they who are drilling in the block next to the squad of soldiers.

Lubrication is the subject of the women's drill this afternoon. Last week they had the tire manual, in which they did everything from inflating a tire to vulcanizing. In their course will be included every phase of the motor car. They are to be experts not only in driving but in care and repair. They already have begun to serve in recruiting. They furnish cars and drive when there is call for recruiting. Just to-day at noon 100 Chicago women furnished cars for the jackies from the Great Lakes station as they passed through the loop on foot and in cars behind their band on the way to somewhere in the East. The women who furnished these cars and countless other women of the city are as ready to drive ambulances, supply cars or trucks and messenger cars as are the women of Europe and Canada who are driving motor vehicles at the battle front even.

The Navy League detachment of women will meet every Friday from now on. A similar organization, though more local, the women driver's service detachment, is meeting every Wednesday. In addition, there are more limited classes in instruction. All of which argue the readiness with which any call for woman drivers will be met.

When the call comes, they will be ready to drive motor cars for Uncle Sam—and repair them, too, for they are learning the alphabet of the chassis from A to Z

How Not to Fear Fearing to Drive

THE most difficult thing a woman has to overcome in learning to drive a car is not to be afraid of being afraid. That is, women as a whole lack confidence in themselves to handle the unexpected, should the unexpected occur. Mrs. Patricia K. Webster, who sells Franklins in San Francisco, tells how to overcome this condition.

"I believe that good driving is simply a state of mind and that as soon as anyone discovers how easy it is to handle a car and how near an impossibility it is for an emergency to arise that cannot be met with little effort, when the simple mechanism of the modern car is mastered, she has learned about all there is to know in order to drive a car," she says.

"Of course, one might know what to do under practically all conditions and still not do it. Here is where lots of women fail as good drivers; their fear of doing the wrong thing is so great that they do nothing at all.

"I have yet to see any woman who has not been benefited materially by driving. The fresh air, the co-ordination of eye, mind and muscle, the exhilaration of feeling that you are master of the powerful and yet tractable engine and that it will answer your every whim cannot help but

have a beneficial effect on the nerves. In fact, I firmly believe that driving is the greatest nerve tonic in the world.

"I have driven my Franklin over thousands of miles of all kinds of California roads, boulevards, deserts and mountains. The fact that I have never had an accident of any kind adds a lot to the sum total of my pleasure, of course, but I know that even had I experienced a lot of trouble, I would not sacrifice for a great deal the actual gain in health and the joy of driving that I have experienced in my car."

New York Women Prepare to Drive

WHEN the band of New York women, whose activities are illustrated on these two pages, decided to learn all there was to learn about motor cars, they knew that skirts and dainty blouses would have no place at all in the learning. You cannot take an engine apart and explore all its inner mysteries while wearing a delicate Georgette crepe waist and a silk skirt. The mechanic's notebook seemed the best fashion guide, and the women chose bloomers as the proper costume.

The class is being conducted at the West Side Y.M.C.A. Auto School, one of the largest. When the women complete their course they will be skilled mechanics and drivers. In one picture Mrs. I. L. Hill and Miss Jean Dean Barnes are collaborating on the old song of "Get Out and Get Under." Miss Barnes is on the stretcher. In another a group receives first-hand information on the engine and its idiosyncrasies.

It may be that she will have to get out and get under when driving, so she does it now while she has an instructor to see that the under side is a familiar side

Recruiting by Windshields

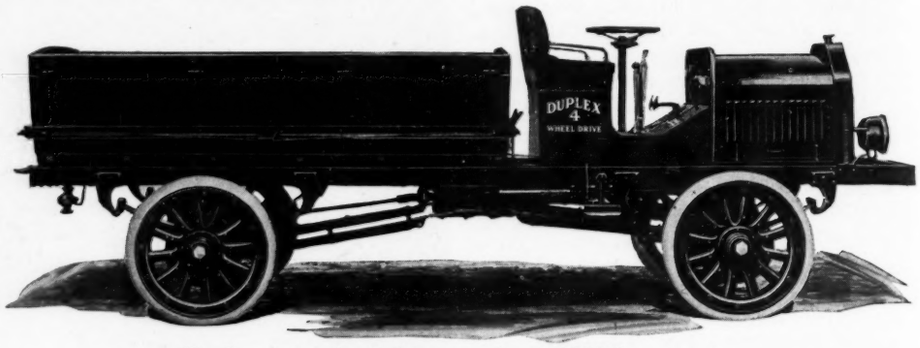
WASHINGTON, D. C., April 14—The latest thing in the way of stimulating recruiting for the army and the navy is the windshield campaign. The idea, originated by the Navy League of the United States, is to seek to get as many of the 2,500,000 car owners in the United tSates as possible to display on the windshields of their cars a poster in blue and red, which reads, "Your country calls. Join the Marines. For information, apply recruiting station or Navy League." This poster is not large enough to obscure the vision of the windshield. As this is something women can do to strengthen the navy by recruiting, they are active in its support.

No matter how inexperienced the beginner is, by the time she is through she will be informed on all parts of the car

Nothing is left out of the course, and changing tires quickly is one of the requisites of success in the preparedness

Duplex Truck Drives Through All Four Wheels

Self-Locking Differential Adds to Pulling Ability



Duplex four-wheel drive truck of 7000-lb. capacity

IN THE Duplex four-wheel drive truck both front wheels exert a constant, smooth pull while both back wheels at the same time exert a constant push. By this method power generated from the engine goes into traction through four wheel surfaces instead of two with the resultant added gripping surface and the principle that if one pair of wheels gets stuck there is the other pair on good ground to pull them out.

The four-wheel drive is made practical by the internal-gear drive in each wheel. There is a sixteen-tooth spur gear at the end of each live axle which meshes with a sixty-four-tooth internal ring gear attached in a housing to each of the four wheels, giving a 4 to 1 gear reduction. The weight, therefore, is carried on the dead axles, meaning that the driving or live axles may be made much lighter than in bevel-gear-to-wheel drive construction.

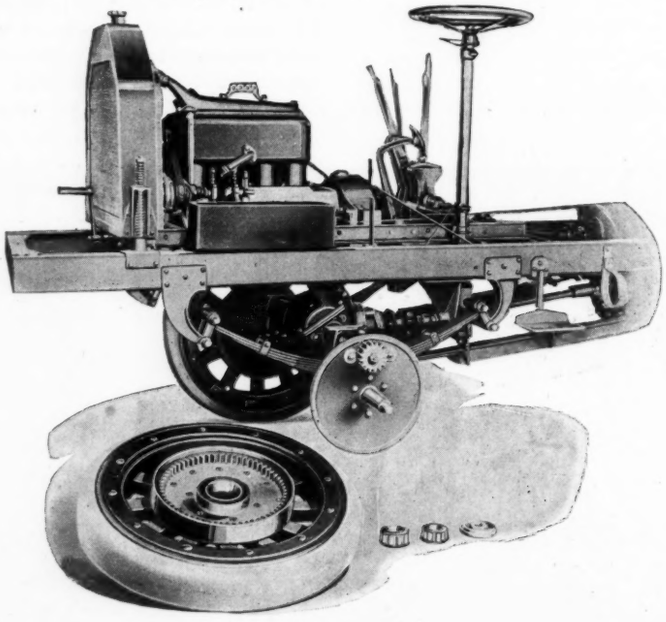
The Duplex Adler automatic self-locking differential is another interesting feature of the product. This device allows for necessary play between the wheels, but when one wheel slips the differential automatically and positively throws the entire power over to the wheel on the opposite side which still has road traction. With four wheels for this principle to work through it may be seen that there is little chance of getting in such a place where at least one wheel will not give traction.

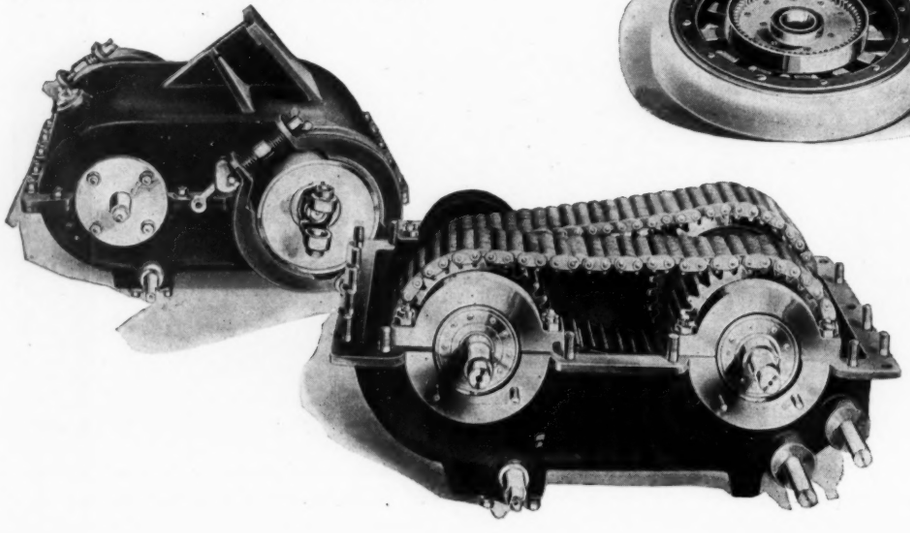
The Duplex chain case, by means of a silent chain belt, transmits the power from the main propeller shaft to the shafts actuating the front and rear axles. By means of a second or reserve chain and sprockets this chain case provides the driver an extra 2 to 1 gear reduction whenever he needs it. With a motion of his hand the driver may obtain a leverage of 64 crankshaft turns to every revolution of each of the four wheels or, in other words, a full power stroke of the engine for every 2 in. of truck travel.

The spring suspension is semi-elliptic with shackles at each end, so that no matter how loaded the wheelbase is always the same. Both front and rear springs are 43 in. long. The frame is of pressed steel, channel shaped, held at the corners by gussets of boiler plate. It is 18½ ft. long. Special provision is made in the rear-end construction of the frame to withstand wrenching strains on the drawbar from a string of trailers in tow.

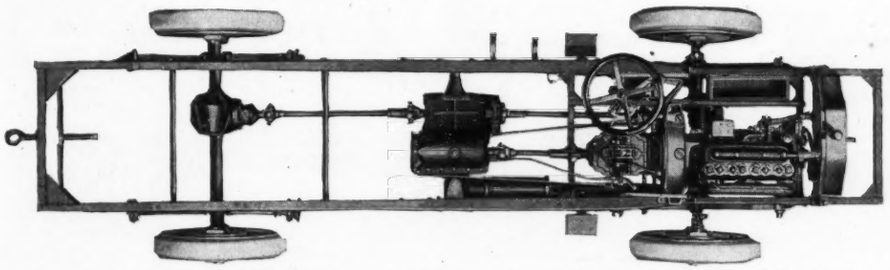
The engine is a Buda four-cylinder, block-cast L-head type with 4¼-in. bore and 5½-in. stroke. Oiling is by stroke plunger pump to the main bearings and timing gears with constant level splash to the cylinders. A Schebler float-feed carbureter furnishes gas and ignition is by an Eisemann high-tension magneto.

Cooling is positive water circulation by a gear-driven centrifugal pump through a round vertical tube radiator. The wheelbase is 130 in. and the normal capacity 7000 lb. Price, $3,600. The Duplex Truck Co., Lansing, Mich.

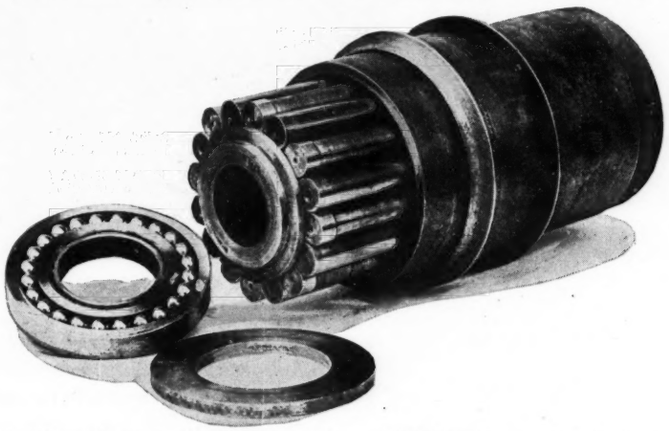




Above — Duplex front assembly showing internal-gear drive construction and propeller shaft extending to front axle from chain case. Left—The Duplex Chain box, closed and opened. This transmits drive to the propeller shafts and serves as an auxiliary gear-reduction medium



Chassis layout of the Duplex four-wheel drive truck. Note that the engine is offset



Lyons roller bearing which has seen over 20,000 miles service in a motor car without lubricant

Lubricant-less Roller Bearing

Elimination of Sliding Friction—Solid Construction

A ROLLER bearing with rolling friction only and so constructed as to present a roller construction with the solidity of a plain bearing and requiring no lubricant under the most vigorous service is covered by a patent assigned to D. E. Lyons, a Pacific coast inventor who has representation under the direction of D. M. Carr, Fort Dearborn Hotel, Chicago.

The bearing is simple and revolutionary in mechanical construction. Friction is naturally reduced to the minimum, as there is no sliding contact. It differs from other roller bearings in that it has no cage, cone or rivets. It consists of three principal parts, the sleeve, rollers and outer casing, or box, the whole forming a complete unit.

The anti-friction principle, which eliminates need of lubrication, is accomplished by the separating of the bearing rollers with spacing rollers. The spacing rollers carry their own weight only and revolve in a direction opposite to the movement of the bearing rollers, giving an entirely free rolling movement to both the bearing and spacing rollers. This mechanical movement is brought about by having the bearing rollers of a size to fit snugly between the sleeve and the outer casing, taking all of the weight imposed upon the bearing through a practically solid construction. The spacing rollers are a few thousandths of an inch smaller than the bearing rollers with the result that they carry none of the bearing load but float free between the bearing rollers and revolve in the opposite direction, being turned over by the bearing rollers themselves.

Thrust is taken up in a truly unique manner. The roller ends have a slight depression. These depressions are slightly above the flange of the sleeve as may be seen by the photograph. The ball thrust bearing shown fits over the end of the flange and the balls locate themselves into the depressions in the rollers, thus giving a thrust assembly wherein friction is very small.

It is said that the motor car hub bearing illustrated had seen 20,000 miles of service without lubricant before the picture was taken. Quite naturally the bearing is adaptable to any moving device where a bearing can be used.

Tests conducted by A. Vail, master mechanic of the Pennsylvania railroad, go to show a saving of energy in 78.8 per cent over standard truck bearings. These bearings were used in the rear wheels of the rear truck of a locomotive tender, to make the test. After the test the truck was placed under a 143,000 lb. tender which is in fast freight service and the mileage of the bearings without lubricant is now well over 15,000.

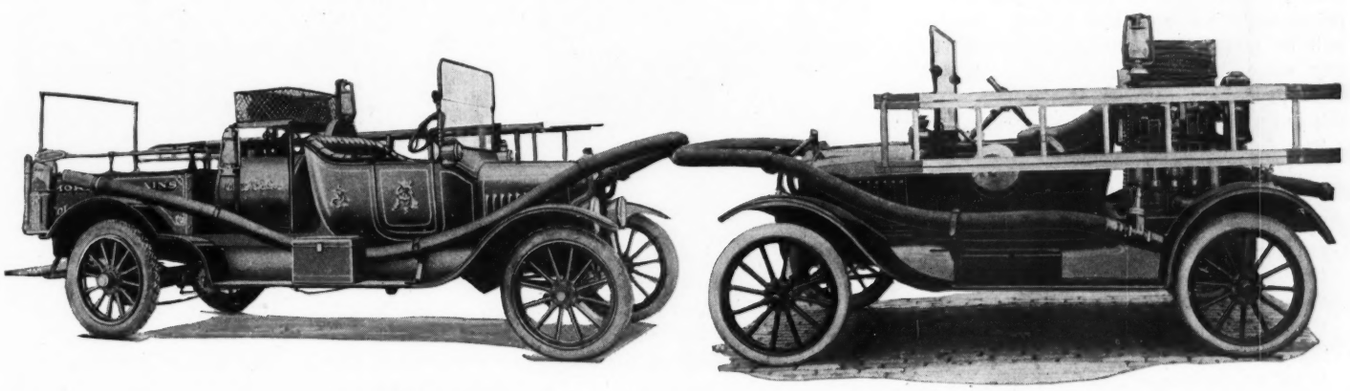
FORD FIRE FIGHTERS

Fire fighting apparatus for attachment to Ford cars is being produced by the Buckeye Mfg. Co., Anderson, Ind., extensive builders of fire fighting equipment. The machines combine in one assembly a gasoline pumping fire engine, a first class chemical equipment, a small ladder equipment and the smaller model is arranged to draw the hose reel or hook and ladder truck behind it as a trailer.

The machine is also built with a hose body on it, as illustrated in the photograph. As a water thrower its capacity is 6 to 8 barrels a minute, and it will throw three streams 80 to 100 ft. high. It has a speed of 25 to 30 m.p.h., making it possible to get to the fire very quickly.

WOULD LOCK DEAD ENGINES

St. Louis, Mo., April 16—The police department has announced that it will ask the enactment of an ordinance requiring all motor car owners to lock their machines by some form of lock when leaving them with the engines dead.



Two of the Buckeye fire fighting apparatus mounted on Ford chassis

Speedster Bodies for Saxons

Open and Closed Types for Fours and Sixes

Open and closed Schutte bodies with a front view of a remodeled six

A LINE of special bodies for Saxon cars is being marketed by the Penn Auto Co., Saxon distributor in Lancaster, Pa., Charles E. Schutte, proprietor. There are open and closed speedster types for both the four- and six-cylinder models, a delivery body for the four and special equipment for the standard car. The bodies were first produced for local trade and were designed to stimulate sales. Schutte's efforts in this direction were so successful that he will supply other Saxon dealers.

The No. 1 open type body, upholstered in imitation of leather, has bucket seats and is made for the six-cylinder chassis.

The dealers' price of $125 includes the dash, seats, upholstering, tank, rear deck and linoleum covered floor boards, as part of the equipment.

The No. 7 body is a streamline race-about model, also for the six-cylinder chassis and sells for $150. If desired, the stock fenders and running boards can be used with these bodies.

The No. 4 body is the open type with bucket seats for the four-cylinder chassis and sells for $85 with the same equipment as above.

The No. 8 is a delivery body for the four-cylinder and is made in two grades—A grade, $100; B grade, $80. The above prices include one coat of primer. Bodies will be tastefully painted and striped in any color desired at an additional cost of $12, sufficient of the same coloring being shipped with body to finish the chassis.

The following extra equipment is furnished:

Genuine leather upholstery, $15.
Special heavy steel tire carrier (Mercer type) for one wheel, $12.
Double tire carrier, two wheels, $14.
Special lamp irons, $5.
Heavy khaki rain cover, $8.50.
Single tire carrier, four-cylinder, $7.
Double tire carrier, four-cylinder, $8.
Heavy plate step at side, $2.
Collapsible top, $25.

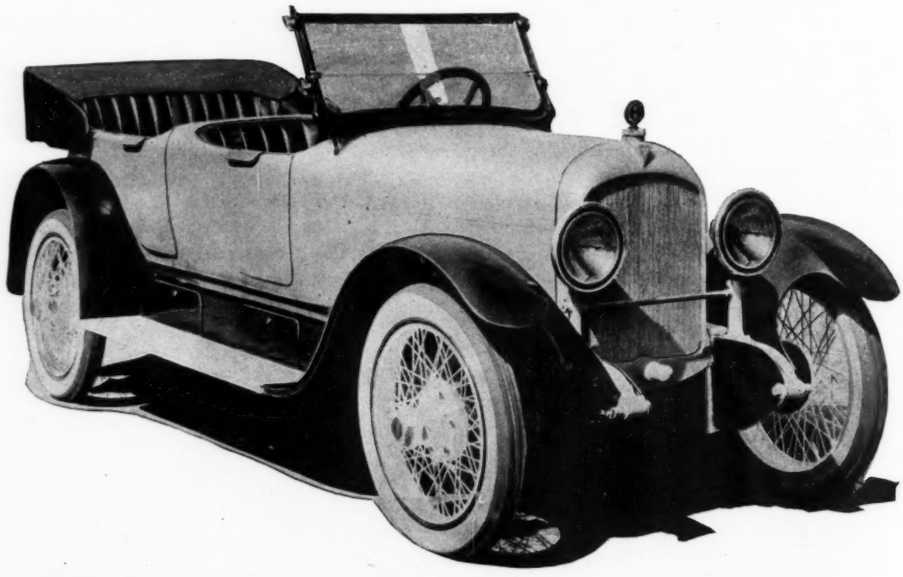
If desired, the bodies will be striped and painted, sufficient color being shipped so that the chassis may be finished by the dealer. Ten photographs showing all the different styles are sold in case the dealer desires to have these bodies manufactured locally.

The delivery body, which is only mounted on the four-cylinder chassis, has a Crown top, double plate glass doors in the rear, a removable seat next to the driver. The body is attached by sawing the door sill through at the center and taking off the runabount body. A steel plate is fitted across the sill end of the door and two large thumb screws hold the body in place. All that is necessary to remove the body is to loosen the two large thumb screws.

HANSON PLANT IN MONTH

Atlanta, Ga., April 13—The plant of the Hanson Motor Co. will be completed in thirty days.

Production will start in May at 10 cars a day and will increase as contracts require. The plant has a capacity of 100 cars a day. The Hanson-Six which the company will build has an engine specially designed by Don M. Ferguson. The exact price of the car has not been determined, but it will sell somewhere in the $1,000 class. Officers of the company include George W. Hanson, president; Arthur Burdett, vice-president and sales manager; and Don M. Ferguson, chief engineer.



The Darling car to be made in Dayton, Ohio, in the old Wright-Martin airplane plant will have one chassis with several bodies. The illustration shows the first body model. The price is not yet fixed, but will be under $2,000. The chassis has such units as Continental engine, Borg & Beck clutch, Timken axles, Kellogg tire pump and Boyce Moto-Meter. The chassis will have a 130-in. wheelbase

The Accessory Corner

The Fordalarm

THIS is an electric horn push button, mounted just beneath the steering column, on the end of the gasoline control lever. It is attached by sliding it in place over the end of the lever, andtightening a clamp screw. The position is most handy, as in emergencies the driver's hand is usually on the throttle and can then sound the horn and close the throttle at the same time. Price, $1. Detroit Novelty Co., Marquette Bldg., Detroit, Mich.

The Fordimmer

This device is designed to prevent the lights of the Ford from burning out at high engine speed. It consists of a variable lever-controlled resistance, mounted in a case, attached to the steering column. As the engine speed increases, the voltage increases, but the voltage reaching the lamps is cut down by changing the switch lever. The device may also be used as a dimmer in city driving. Price, $1.50. Detroit Novelty Mfg. Co., Marquette Bldg., Detroit.

It's-It Portable Tube Vulcanizer

A new portable electric tube vulcanizer recently placed on the market by the Premier Electric Co., Ravenswood, Chicago, has been named the It's-It. It operates electrically, thus eliminating fire risk. To operate the patch is applied, the vulcanizer is attached to the battery, current is left on for 10 min. and the job is done. It is claimed that the vulcanizer consumes very little current and thus its use is not detrimental to the battery. It can be used in conjunction with the Ford car by running the engine to furnish current from the magneto. The instrument lists at $1.50 complete.

Bull Pup and Terrier Dash Lamps

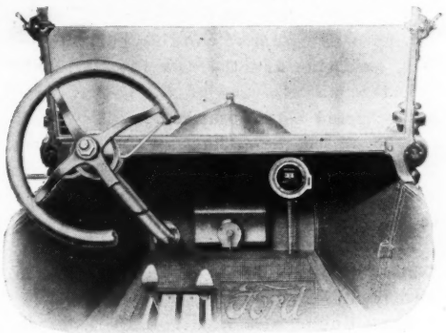
Dash lamps made especially for the new cowl dashes that are being turned out by speedometer manufacturers for use on Ford cars are known as the Bull Pup and Bull Terrier lamps. With these dashes the speedometer is set flush and the lamps are made to light the instruments correctly. One of the lamps is for wood dash and the other for metal dash, the former being the pup and the latter the terrier. The lamps are made of brass throughout, highly polished and nickel plated. There is a switch embodied in the lamp stem so that it can be turned on or off at will. Metal Specialties Mfg. Co., Chicago.

To Save Gasoline

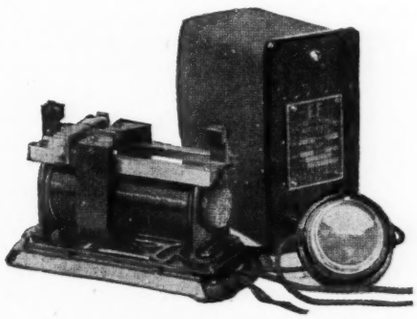
A novel steam motor device which is said to create a saving of from 20 to 35 per cent in gasoline and give from 3 to 5 more miles to the gallon has been invented by H. Z. VanWormer, Grand Rapids, Mich. It consists of a water tank and steam dome with connections from the tank to the exhaust manifold and with the dome to the intake manifold. The water is heated in the exhaust and rises to the dome, from whence it is expelled to the intake. The mixture of the steam with the gasoline and air produces the results.

New Oxilium Apparatus

The Oxilium apparatus is just being placed on the market by the Cox Brass Co., Albany, N. Y. It consists of outfits for welding, brazing, soldering and lead burning and the parts that make up those outfits, such as oxygen regulator, cutting torch and controller. The lead-burning outfit includes an oxygen regulator, controller, No. 21 torch with assortment of tips, all necessary hose with connections, goggles, wrench and instruction sheet. Price, $40; with 3000-lb. tank pressure gage attached, $45. The welding and cutting outfit includes all the above and a No. 11 combination torch with welding and cutting tips, extra oxygen hose with cutting valve and fittings, and a supply of welding rods and fluxes for cast-iron, aluminum, bronze and copper. Price, $80; with 3000-lb. tank pressure gage attached, $85. The controller shown on this page is $25.



New Stewart-Warner instrument board for Ford cars



Alternating current rectifier that is self-starting

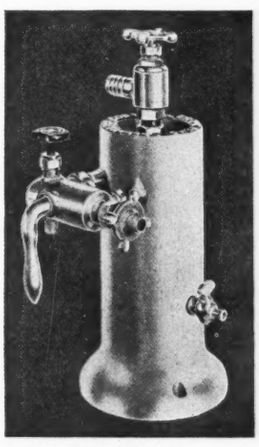
Above, the Fordimmer and, below, the Fordalarm

Alternating Current Rectifier

The F-F Battery Booster is self starting, and when the alternating current is turned off or stops for any reason the battery is cut out and cannot discharge through the rectifier. The device works independently of the condition of charge in the battery, and the ammeter shows the exact rate of current going into the battery at all times. The carbon electrodes are adjustable for wear, and a new set costs only 50 cents. The device is very simple. Simply plug into a convenient lamp socket and connect charging leads to the corresponding battery terminals. Prices range from $15 to $18, with ammeter. The France Mfg. Co., Cleveland, Ohio.

New Stewart Instrument Board

The Stewart-Warner Speedometer Corp., Chicago, has brought out a new instrument board for Ford cars. It is made of black enameled wood and takes the place of the former instrument board, which was made of steel. The speedometer is mounted flush with the board and is set off by a nickel flange. To install it is only necessary to pull the steering column down slightly and spring the board into place. Price, complete with speedometer, $11.25.



Oxilium controller for welding outfits

The Readers' Clearing House

A Mid-Summer Night's Dream

ATLANTA, Ga.—Editor MOTOR AGE—I was sleeping soundly last night, at the close of a hard day's labors, when, in my dreams, a person (shall I say, a man) appeared to me and spoke to me as follows: "As thou hast long been a true worshipper at the shrine of My Lady Gasoline, methought that possibly thou wouldst be interested in a slight insight into the future, and wouldst like to see the automobile of 1920, the car par excellence."

Upon my stating that it would afford me much pleasure to be enabled to obtain a glimpse of the ultimate car, for apparently there is little room for improvement in the present masterly creations of to-day, a large curtain rose, and I saw THE CAR, which I shall endeavor, in a few stumbling words, to describe.

In the first place, the engine was six-cylinder, having a stroke approximately two-thirds greater than the bore. The cylinders, of course, were cast in block. The pistons had five rings, three being above the pin and two below. It is, of course, useless to state that the valves were in the head. This engine had double intake and exhaust valves, thereby obtaining instantaneous admission and expulsion of the gases to and from the cylinders.

Control Automatic

The valves were mechanically operated by camshaft located upon the cylinder heads. Instead of relying upon springs to force the valves closed, recourse was had to grooves in the sides of the cams, near the outer edges, in which were working pins, or projections, on the ends of the rocker arms.

I hardly need state that the starter was electrically operated. Instead of using the makeshift push-pedals or buttons located on the footboard, recourse was had to a push button located with the remainder of the control assembly in a small, neat, compact box on the steering column immediately below the wheel. A child would thereby be enabled to start and operate the car with perfect ease; howbeit ample provision was made against accidental or malicious operation of the starter by having the starter control system inter-connected with the ignition switch, which operates only in conjunction with its special key, so that the starter will remain inoperative until the ignition switch is turned on in the proper way. Provision was made for obviating danger of inadvertently operating the starter while the engine is running.

There were two spark plugs for each cylinder, located at an angle of 90 deg.

The Future Car

from each other on opposite sides of the cylinders. This caused a spark and consequent explosion at opposite sides of the cylinders at the same time. Both plugs being operated by the same magneto would, of course, necessitate the sparks in each cylinder being perfectly synchronized. This would cause instantaneous ignition of the gases, causing a much livelier engine.

The carbureter was extremely simple, having a minimum of working parts. Gasoline, kerosene, and the new invader, alcohol, the manufacture of which has been so perfected that the commercial product can be placed upon the market at a price that will enable it to successfully compete with gasoline, work equally well with this carbureter.

It is unnecessary to take up time stating that the intake and exhaust manifolds were cast integral with the cylinders.

The oiling system was the highest development of the positive force-feed system, thoroughly oiling all working parts, not only of the engine, but of the entire chassis.

The clutch was the old reliable time-tried and proved dry-plate disk, improved and refined in some few respects.

The gears were electrically operated, having four speeds forward and one reverse, controlled by push buttons located on the upper end of the steering column. The driving gear ratio was three to one on fourth, which was direct drive. This ratio, together with the extremely flexible and powerful engine, permitted speeds of from 5 to 75 m.p.h. without touching anything with the exception of the accelerator.

The spark control was automatic, being designed to work on somewhat the same general principle as the ball governor used extensively in steam engineering practice. This permitted the spark to be well advanced while the car was running at moderate speed upon the level, but, upon striking a hill, with the consequent slowing of the engine, the spark was automatically retarded, thereby eliminating the possibility of the driver forgetting to retard the spark, with the resultant pounding of the engine.

The left foot pedal combined the clutch and the external contracting brake located on the rear-wheel drums. The right foot pedal combined the internal expanding brake located upon the rear-wheel drums with the internal expanding brake located upon the front-wheel drums. This enabled all of the available brakes to be applied in case of emergency with the feet, thereby leaving both hands free for the steering wheel, gear change, etc. The brakes on the front wheels, when used in conjunction with the rear-wheel brakes, enables the driver to make a much smoother, and, if desired, a much quicker stop than was possible heretofore.

Wire wheels were used exclusively.

The weight was reduced from 200 to 600 lb., due to further refinements in compounding steels, alloys, using aluminum pistons, etc.

So we might give a brief summary of the car as follows:

First—Multi-cylinder exponents to the contrary, the six-cylinder, valve-in-head, blockcast engine will be the logical ultimate engine.

Second—There will be three standard sizes of cars, namely, 25, 35 and 45 hp.

Third—The fuel consumption will be gratifyingly low. The large cars will average 18 to 20 miles, the medium cars 25 to 28 miles and the small cars 30 to 35 miles per gallon of fuel.

Fourth—Tires will be made in three standard sizes, to-wit, 30 by 3½ for the small cars, 34 by 4 for the medium cars and 36 by 5 for the large cars.

No Freak Designs

Motorists will demand the discontinuance of special freak designs, colors, etc., and will demand service and dependability for their tire equipment. By doing away with the multiplicity of sizes, the rubber factories will be enabled to devote their entire time, resources and ingenuity to the three sizes named, and, by producing each of these in enormous quantities will be enabled to market a much better product at a lower price.

Fifth—The average car price will be in the immediate neighborhood of $800, the small car being about $600, the medium car about $1,000 and the large car from $1,500 to $1,800. There will only be about a half-dozen makers marketing cars listed in excess of $2,000.

Sixth—Conditions will be much better for the tourist, at least insofar as the license proposition is concerned. While the owner will be required to obtain his license in the commonwealth in which he resides, this license will be recognized and honored in any states in the Union, as well as in Canada and Mexico. So the tourist may travel to his heart's content without being worried by having to continually consult states' laws, secure permits, licenses, etc.

Seventh—The license rate will be in pro-

portion to the horsepower rating. The charge will average $2 for the small cars, $3 for the medium cars and $4 for the large cars, while trucks will be subject to a uniform charge of $5. Cars in municipal, county, state and government service will be subject to a uniform charge of $1.50, regardless of size. Dealers will be subject to a uniform charge of $5, which will include four license numbers, and an additional charge of $1 will be made for each additional number plate.—J. N. Brightwell.

HOME-MADE BED BUILT IN FORD

Reader Outlines Method of Altering Body for Sleeper

Daytona, Fla.—Editor MOTOR AGE—In the March 15 issue I notice a request for information as to the mode of converting a car into permanent sleeping quarters for touring. We have just returned from a trip of 1400 miles in a five-passenger Ford car in Florida with the front seat cut down to let back on hinges to fill the space between front and back seat. This was done by making a light open slot extension to fill from front seat to the curve of the dash with a screw hook at each corner to hook four short chains into, that are fastened to top edge of the body which brought it up flush with top of cushion. When not in use it can be put under the cushion of the front seat.

To make the cut in back of the front seat, measure from the bottom of the back seat cushion on a level to the bottom of the front seat. Then measure the same distance from the top of the seat down and strike a chalk line straight across; this will give you your bottom cut. Measure the widest part between the sides of the front seat, center it on the back of theseat; this will give your end cuts. Upholstering is cut through the opposite cut in the back. Loosen up the upholstering at each end far enough to put your end reinforcements, which are of wood, to stiffen the seat where cut away and fasten the upholstering to. By looking at the photograph in Fig. 1, 2, 3 you can get a better idea. You will also have to have a hard wood strip 1½ in. cut to the shape of the bottom of the seat to stiffen where cut and fasten three hinges to let the back down. I used round-head screws ¾ in. long, 1½ in. apart to fasten the iron to the wood reinforcements. Be sure and fit the end pieces so that when the back is closed up it leaves an even, smooth joint on the face; then replace upholstering. To hold the back seat up in place when down, I used two pieces of wood 1 by 2 in. hung on a hinge to the floor board close to back seat. On the Ford car the mat pushed back against the legs holds them in place when not in use. Cut the length so the upholstering is even on top.

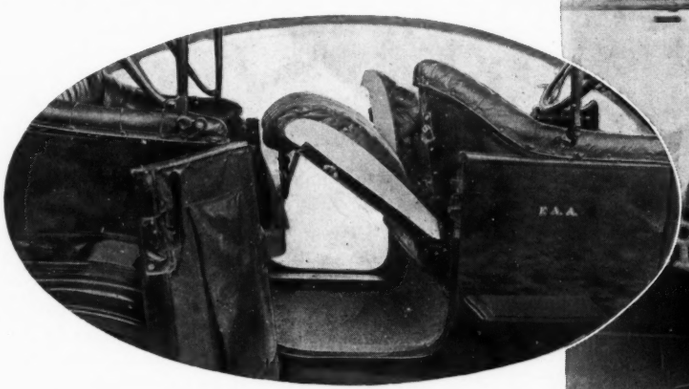
With the seat let down, and a pad or mattress is placed over all, you have a bed with more room than on a Pullman sleeper.

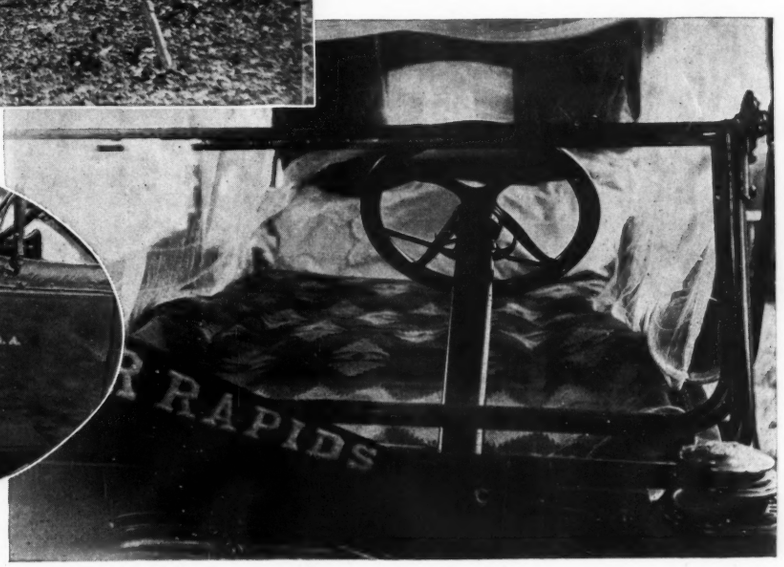
The fastening to draw the seat tight together when closed up, is shown in the illustrations. There are several kinds to use but I think the thumb nut is best to tighten the hook catch so it will not rattle or come off. Be sure when putting it on to set it so that it draws the joint tight together.

About the most important thing to have on your trip is mosquito netting to cover the bed. Cut a piece of netting the size of the top of the car; sew a piece of white tape around edge; measure from the top of the car down at least 6 in. farther than the top of the bed. Use that length for the sides and sew it to the top piece. To fasten, screw three brass cup hooks at each end, and two or three on the sides in the frame of top as far up as you can.

Sew brass rings in the top opposite the hooks and when in place, mosquitoes will not bother. Use the finest mesh of netting you can procure.

The hardest part of the job is how to cut the back down. Procure a hack saw with 12- or 14-in. blade, fine tooth, or a brass saw. Cut down on the ends as far as you can from the top, remove the saw blade and fasten a handle to each end. Now you will have to have a little help in order to pull the cut from the front of the seat, and to guide the saw. The lower corner you can have square or round, but I think the square is the easiest to put the reinforcements in, for if square, you will have to drill three or four small holes on the bottom line to start the saw on that cut; you saw both ways to the opposite cor-





Figs. 1-2-3—Left, a Ford car with a tent to inclose its home-made bed. Bottom left, showing hinged back seat which drops down to form bed. Lower right, the bed made up for the night

ner. Be sure and brace the seat up so it will not fall back before it is all cut out and falls down and bends the iron.—F. A. Allen.

SAXON KNOCKS INTERMITTENTLY

Would Appear to Be Caused By Loose Connecting-Rod Bearing

Bidwell, Ia.—Editor MOTOR AGE—Can Ford wheels be adapted to a 1916 Saxon roadster, four-cylinder model? I would like to put on larger sized wheels, the same as 1917 model has, and as cheaply as possible.

2—My engine is inclined to overheat, especially during the hot summer months. Is there any way to increase the cooling capacity of this car?

3—I noticed an advertisement for using part of the exhaust gases, introducing the gas into the water inlet connection between the radiator and the engine. They claimed that this installation made it impossible to boil the water. Would such a device help?

4—When car is standing with engine running there is a humming noise made by something in the gear case which sounds as if the bearings in the front end of gear case were running dry, but this cannot be the cause as I have plenty of steam cylinder oil in the case. What does this noise indicate?

5—When I speed the car up a bit the engine develops a slight knock, this usually showing up on level roads after a good speed and when I am holding the throttle steady. I think there is a slight end play in the crankshaft. Could this be the cause of the knock? There is also another knock in the gears operating the camshaft. An expert tells me this is caused through the fact that at a certain point in the revolution of the camshaft the valves have a tendency to run the camshaft backward and that they hold this shaft still, causing the teeth on the gears and camshaft to clock together. What is the cause of this knock?—K. F. Clardy.

1—Ford wheels will not fit this model. However, Saxon can furnish you with larger wheels.

2—A good tinsmith can solder an extra tank onto the top tank of the present radiator. It would be a case of building a copper tank with about 1-gal. capacity which would conform with the shape of the hood, this tank to be soldered onto the radiator tank.

3—It is very probable that this device would eliminate the overheating.

4—The noise is in the timing gears. If it is merely a humming and not an excessive rasping sound, there is nothing wrong. However, if the latter condition exists the timing gears may be worn or the teeth broken and the remedy would be replacement.

5—It is unlikely that there is a knock caused by end play of the crankshaft. It is more probably due to too quick throttle opening with spark advanced, carboned cylinders, loose piston or wrist pin, loose connecting rod bearing, or some of the other varius sources of knocking. The writer has seen one of these models operate in much the same manner. There was a knock which occurred on heavy pulling, but was not evident when a light load was being carried by the engine. An examination proved that the knock came from a loose connecting-rod bearing. Your statement that there is a knock in the timing gears and, in your question No. 4, that there is a hum in the front of the engine, leads us to believe that these gears are badly worn. The fact that there is a play in the gears to the extent that the valves have a tendency to hold the cam bearing is further evidence that the gears are either badly worn or are out of proper mesh.

Inquiries Received and Communications Answered

J. N. Brightwell	Atlanta, Ga.
F. A. Allen	Daytona, Fla.
A. D. Smith	Quincy, Ill.
A Reader	East St. Louis, Ill.
Emmet Wolf	Flint, Mich.
S. L. Conrey	Chanute, Kan.
R. F. Downs	Washburn, Wis.
H. B. Kingsbury	Fort Worth, Tex
Gus Barlemann	Converse, Tex.
George Kirby	Dadeville, Mo.
E. A. Campbell	Argenta, Ark.
N. M.	Escanaba, Mich.
S. P. Coleman	Salem, Ill.
A Reader	Wilkinsburg, Pa.
Will Eldridge	Memphis, Tenn.
Charles F. Smith	Lacon, Ill.
Harold L. Johnson	Bridgewater, Iowa

MYSTERIOUS ENGINE POUNDING

Intermittent Operation of Water or Oil System Possible Cause

Quincy, Ill.—Editor MOTOR AGE—My Model 35 Studebaker has a knock in the engine. Carbon has been scraped and burnt out; compression is even in all cylinders, testing 60 lbs. in every one, within 1 or 2 lbs. thereof. Crank case has been inspected and all bearings are light. Car seems to run fine at 20 m.p.h. and will go over some hills like a racer, and then come to a smaller hill and show the knock. It is not continuous and has shown up on a level paved street and then gone over a steep hill without a sign of it. With spark and throttle advanced three-fourths on the segment, which is one-fourth farther than company states is proper. It seems to give the best satisfaction. I have about decided to retard the spark at the magneto, but thought I would like to hear from you first.—A. D. Smith.

It would appear from your explanation that either the oiling or cooling system was intermittent in its action. It may be that the lubricant reaches all parts under normal conditions but occasionally fails long enough to allow the engine to heat and a knock occur. The same thing may hold true of the water circulating system. It is suggested that you overhaul both of these systems thoroughly before retarding the spark at the magneto.

HOW OWEN MAGNETIC IS STARTED

Principle of Changing Generator to Motor for Cranking

East St. Louis, Ill.—Show a wiring diagram of the 1912 Stearns Knight. Show how the voltometer should be connected with the lights, generator and battery.

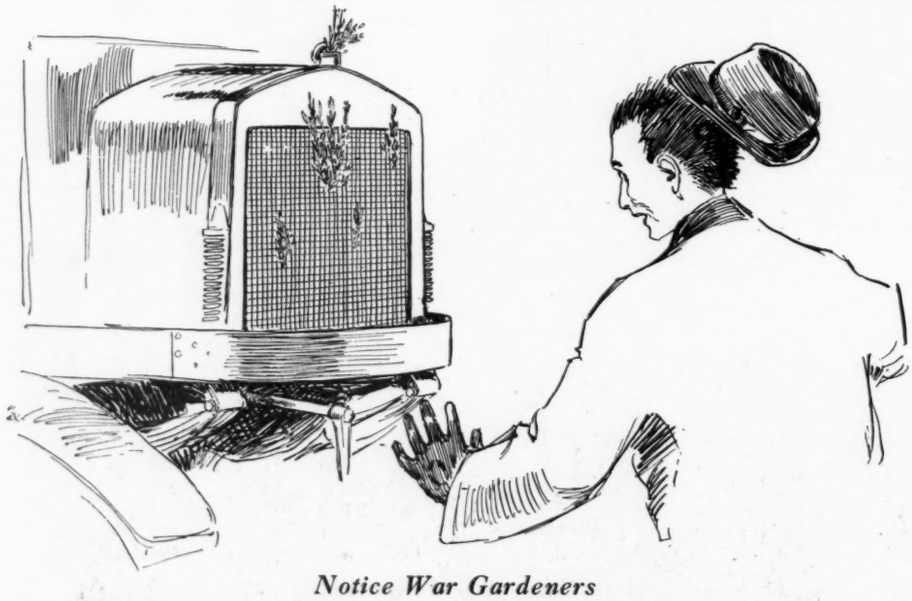
2—In the Owen Magnetic-driven car, how is the engine started without putting the car in motion?

3—Is this car being built for the market, and where?—A Reader.

1—A complete wiring diagram of the 1912 Stearns-Knight will be published next week.

2—The field magnets and coils of the generator form the flywheel of the engine. The armature of the generator is on a shaft running free on a spigot ball bearing in the flywheel and attached at the other end through the motor, which is separate from the generator, to the drive shaft and so to the bevel pinion of the rear axle. Thus the field of the generator runs always at engine speed while the armature of the generator runs always at propeller-shaft speed. Reference to Fig. 5 will make this more clear.

The effect of running the engine and so spinning the field magnets of the generator is to induce currents in the armature which make a magnetic attraction between the armature and the field. This is equivalent to tightening the fields on the armature so that the armature tries to turn with the field and will do so if the resistance to motion of the car as a whole is not too great. This means that part of the energy in the flywheel of the engine goes to the creation of electrical currents in the armature coils, and part to the direct mechanical work of turning the armature and so driving the car.



Notice War Gardeners

Hartford, Conn.—Editor MOTOR AGE*—During a recent cold spell a truck radiator froze and several of the tubes burst. The owner of the truck injected about 4 lb. of flaxseed to stop the leak, but instead plugged the radiator and cylinder jackets. During the process of removing the obstructions it was found that some of the seeds had sprouted.—William J. Johnson.*

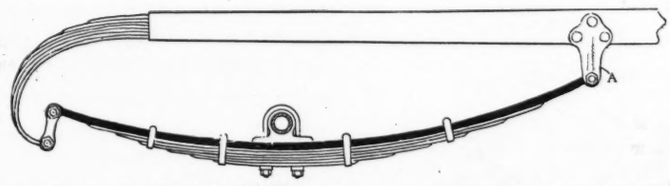


Fig. 4—Diagram to explain principle of Hotchkiss drive. The spring leaf shown in black takes the torque and propulsion effort

Now this current that is created in the armature of the generator is taken to the second part of the transmission which is an electric motor. This is also shown in Fig. 5, and its field magnets are fixed stationary, while the armature is keyed to the same shaft as the armature of the generator. Thus whatever else happens, the armatures are always running at the same speed and that speed is the same as the speed of the propeller shaft. For cranking the engine current from the battery is switched into the generator, causing the latter to behave as a motor and spin the engine. In other words the armature remains stationary and the field is caused to revolve about it, thus causing the engine to spin.

3—Baker R. & L. Co., Cleveland, Ohio.

Hotchkiss Drive Explained

Flint, Mich.—Editor MOTOR AGE—I would thank you to publish in your next issue a description and drawings if possible, of the Hotchkiss drive.—Emmet Wolf.

In Fig. 4 is shown a spring with the main leaf shown in black. It is in this main leaf that the Hotchkiss drive gets its application. When applying power or braking a car there is a propulsion effort in the rear axle in which the axle tends to advance or back up in relative position to the frame. There is also a twisting action to the axle. This must be taken up by some kind of a rigid support between the axle and the frame. In the principles other than Hotchkiss, radius rods, which are rods connecting the axle with the frame, or torsion tubes, which are tubes which surround the drive shaft and make the axle rigid with the frame by trussing between the axle and the gearset or a cross member of the frame, absorb the propulsion effort and torque. In the Hotchkiss principle these efforts are counteracted by the use of a heavy main spring leaf which generally is anchored solidly at its forward end to a casting or a forging which is an integral part of the frame.

REBORE LIMIT ON CONTINENTAL

Not Advisable to Increase Cylinder Diameter Over ⅛ in.

Chanute, Kan.—Editor MOTOR AGE—I have a Grant six, 1916, with 3 by 4½ Continental engine. It has no power and is lifeless in comparison with other Grants. There is no getaway or power on lower gears, heats badly and will boil the water in a half mile at 30 m.p.h. The gasoline consumption is about half greater than others of the same make. This condition has existed from first day of driving and now at 3500 miles. I have a Rayfield carbureter with hot-water jacket and have tried changing metering pins without improvement. I have checked up the timing and it is correct according to specifications. The spark is advanced as far as it will run without knocking. It will only attain a speed of 1800 r.p.m. when it is built, and others develop 2500.

I have installed non-leaking rings which fit fine and give good compression; the water jacket has a free circulation.

I have used the best grade of medium cylinder oil; also heavy and light. The engine runs fairly good but no results.

Will it stand reboring to a 3 1/16" cylinder?

If not, how much will it stand?—S. L. Conrey.

It would not be advisable to increase the bore over 1/16 in. on a side or a diameter increase of ⅛ in. This would give a bore per cylinder of 3⅛ in.

Elmore Carbureter Trouble

Washburn, Wis.—Editor MOTOR AGE—We purchased a second-hand Elmore machine some time ago and think that the 1-in. Model D Schebler carbureter with which same was equipped is too small for the engine, which has about a 4⅛ in. bore. You will probably recall that this machine has a two-cycle engine. What size and type carbureter would you advise?—R. F. Downs.

The 1-in. size is not too small for the engine. The fact of the matter is that the carbureter, being an old timer, is out of date and not designed to handle the present-day low-grade fuel. It is advised that you purchase a modern carbureter. The same make would be adaptable, and you should make provisions for heating the gases by introducing warm air from a stove on the exhaust to the air intake of the carbureter.

Stanley Beach Record

Fort Worth, Tex.—Editor MOTOR AGE—Give the record made by the Stanley Steamer on the Ormond-Daytona beach, several years ago, I think in 1906.—H. B. Kingsbury.

The record was 18⅖ sec. on a flying kilometer, which is at the rate of 122.3 m.p.h.

Conventional Valve Seats

Converse, Tex.—Editor MOTOR AGE—Give information as to what degree most of the mofor car makers manufacture their valve seats, whether 30, 45 or 60.

2—Do you know of any concern printing or distributing what is known as the Automobile directory giving name of all accessory and

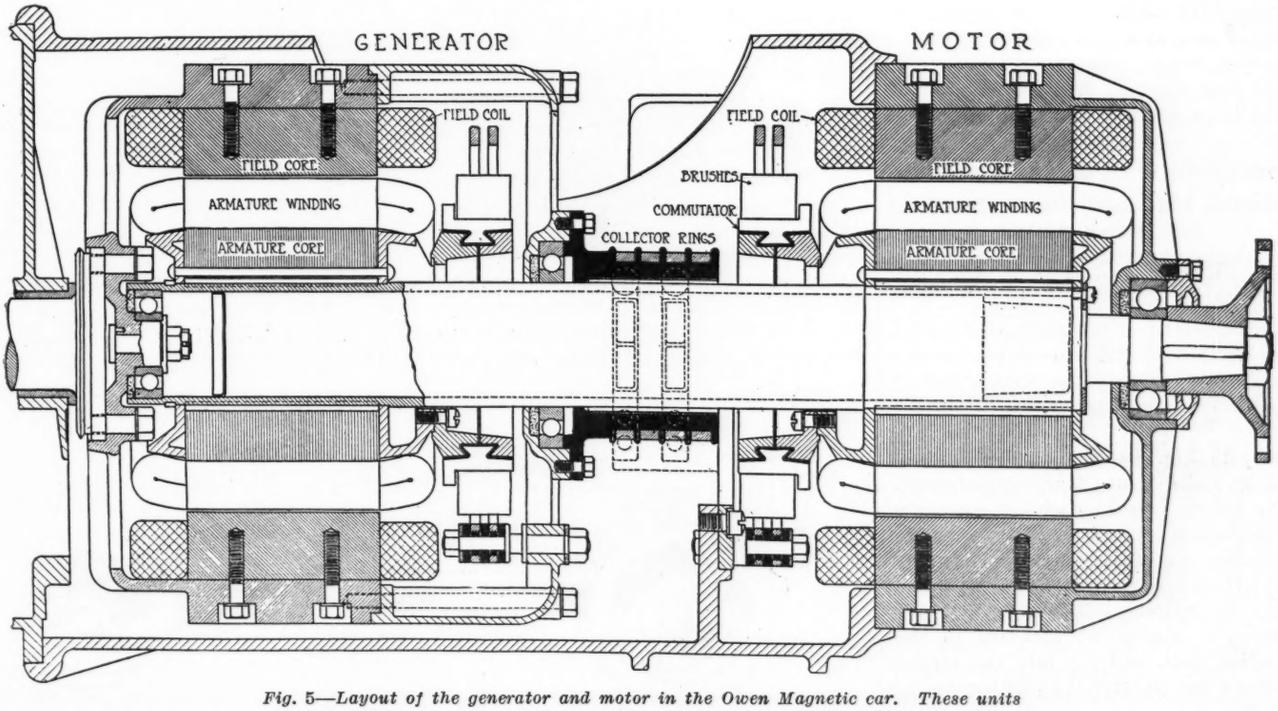


Fig. 5—Layout of the generator and motor in the Owen Magnetic car. These units supplant the gear-change box, start the engine and charge the storage battery

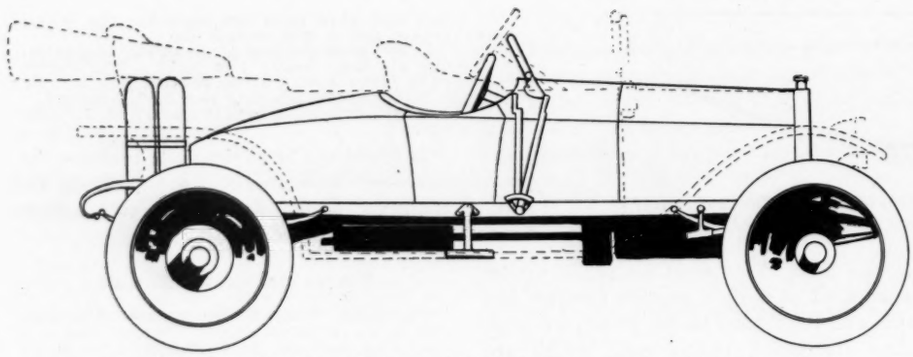


Fig. 6—How a 1909 four-cylinder Mitchell might be cut down into a speedster

motor car manufacturing houses?—Gus Barlemann.

1—The majority have their valve seats at a 45 deg. angle.

2—Automobile Trade Directory, Inc., 243 West 39th street, New York City.

KRIT CUT-DOWN BODY DESIGN

Figures On Speed Increase Gained By Larger Tires

Dadeville, Mo.—Editor MOTOR AGE—Publish a diagram showing a Krit stripped as a speedster. How much would 32 by 3½ tires speed up a Ford stock car?

2—How could I hang a Ford engine in a Krit frame?—George Kirby.

1—A diagram of a Krit cut down is shown in Fig. 7. It is impossible to give an accurate estimate of the speed increase which would be brought about by the use of these larger tires. However, the following data will give you an idea. This considers that the engine will turn the same maximum number of revolutions with the larger tires as with the small ones, which is, of course, impossible. Suppose the Ford is geared 4 to 1 and has 30 in. tires. When this car is traveling 45 m.p.h. the engine is revolving 1763 times a minute. Now leave the gearing the same and put on 32-in. tires. With the engine turning over 1763 r.p.m. the car will travel between 47 and 48 m.p.h.

2—The engine supports, gearsets, etc., are of such different specifications that it would be a procedure of prohibitive expense.

CADILLAC OILING SYSTEM LAYOUT

Illustration and Description of 1910 Model Lubricating Method

Argenta, Ark.—Editor MOTOR AGE—Publish a description and diagram of the oiling system on the 1910 Cadillac, four-cylinder engine. —E. A. Campbell.

The lubrication of this engine is by automatic splash. It takes care of the five crankshaft bearings, the connecting-rod and camshaft bearings, cylinders, pistons, etc.

Refer to Fig. 9. The crankcase is divided by walls A into four compartments. In the bottom of each compartment there is a depression or well, B. The crankcase should always contain sufficient oil so that each of these four wells will be from three-fourths to entirely full and so that the splashers, C, which are attached to the connecting rods, will dip into the supply and throw the oil over the parts to be lubricated.

On the left side of the engine there is a lubricator tank or reservoir which receives the fresh oil. In this lubricator there is a double-acting force pump. One movement of the pump plunger forces the oil through the feed pipe up to the sight feed on the dash. The oil drops to the bottom of this sight feed and from there is drawn by the other movement of the pump plunger and forced to the third compartment of the crankcase to maintain the supply there.

As before stated, the splashers at the lower ends of the connecting rods throw the oil all over the inside of the engine and that which is not used in lubricating drains down the inside walls and into the sloping troughs D at the side. These troughs carry the oil from one compartment to the other so that the supply is maintained uniformly in each.

The adjustment for the oil supplied to the crank case should be so regulated that the quantity in the wells will be maintained as before mentioned. The supply is governed by the length of the stroke of the plunger of the lubricator pump. The longer the stroke of the pump plunger, the more oil is forced through the feed pipe.

On the top of the lubricator, on the plunger, there are two notched collars. The upper one is the adjusting collar attached rigidly to the plunger. The lower one is the locking collar. To adjust the stroke of the plunger, first loosen the locking collar. Then to increase the supply of oil, turn the adjusting collar to the right (screw it down). Doing this gives a longer stroke to the plunger. To decrease the supply of oil, turn the adjusting collar to the left (screw it upward). Doing this shortens the stroke of the plunger. After making an adjustment, be sure to lock it with the locking collar.

USUAL ENGINE COMPRESSION SPACE

Average Crankshaft Offset and General Gear Progression

Wilkinsburg, Pa.—Editor MOTOR AGE—What is the usual compression space in engines?

2—How much is the crankshaft set off center of cylinder and are most engines set off center?

3—What is the general gear ratio of intermediate and low speed and how much power is lost by having them driven by side gears? —A Reader.

1—The usual compression space in engines is from 40 to 35 per cent on the piston displacement. This gives a mechanical compression ratio of between 4.3 and 3.8, or a compression pressure of between 90 and 76 lb. per sq. in. absolute.

2—When the cylinder is set off center it is anywhere from ⅛ to ⅜ in. Most engines are set on center.

3—The gear reductions vary according to the characteristics of the engine. Low, intermediate, and high are generally in, or approximately in, geometric progression. Take a specific case of a three-speed gearbox. The ratios are 3.24 to 1 on low, 1.66 to 1 on intermediate, and 1 to 1 on high gear. This would, of course, be multiplied by a rear axle gear ratio, which may be 4.5 to 1, making the total reductions on low, intermediate and high, 14.5, 7.47, and 4.5. The efficiencies throughout the entire transmission system are about 97 per cent on high, 90 per cent on intermediate, and 80 per cent on low gear.

MOTOR SCHOOLING COURSE GOOD

Subjects Outlined, Together With Practical Experience, Good Training

Escanaba, Mich.—Editor MOTOR AGE—I have a Buick 1917 or 1916 light six, D-45 model. Would it be advisable to equip it with 35 by 4½ or 34 by 4 in. cord tires?

2—Explain how I could attach an oil gage similar to that on the Hundred-point Kissel six, that is a rod extending into the oil, the level being registered on it, much the same principle as putting a stick into water to see how deep it is.

3—Should a Rayfield model GL2C carbureter be hot water jacketed?

4—If the Rayfield GL2C carbureter should be hot water jacketed, would you explain how it should be done?

5—What is the highest r.p.m. of the D-45 Buick, and what N.A.C.C. horsepower does it develop?

6—Why do the Buick valves require frequent regrinding, and how can I tell when a piston is on the compression or firing stroke?

7—Would counterbalancing the crankshaft help, and who makes the necessary parts?

8—What particular college course would be advisable if one entered the motor car business? What would MOTOR AGE think of a mechanical, electrical, and chemical course with industrial management and business administration of about seven years? What would one's opportunities be then?—N. M.

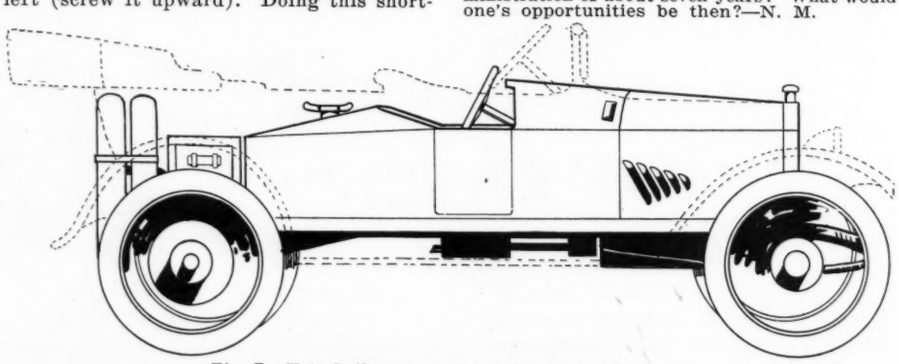


Fig. 7—Krit built over with modern speedster body

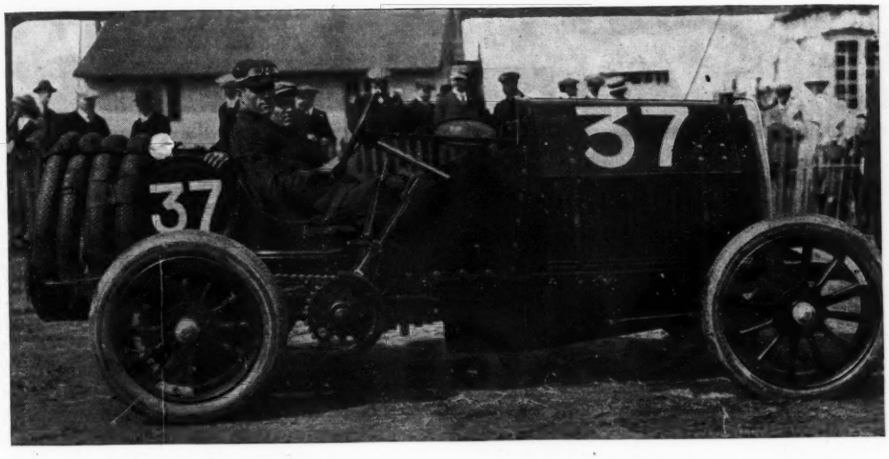


Fig. 8—The late David Bruce-Brown seated in the Fiat car he drove in 1912

1—Cord tires of the 34 by 4 size would be worth-while equipment on this model.

2—It would necessitate expensive alteration and would not be worth while, inasmuch as this model has its own efficient telltale device.

3—The Rayfield model GL2C is hot-water jacketed. As the gas in use at the present time is of a very heavy grade, water-jacketed carbureters are advisable on engines that use the centrifugal pump system of water circulation. A water-jacketed carbureter cannot be used with any great advantage on a thermo-syphon cooling engine because it would be difficult to secure proper circulation. On some engines, hot exhaust is used through the water jacket instead of hot water. This is true for Rayfield instruments on the Buick engines. To meet this design Rayfield manufactures a special outfit for Buick engines, particularly the model D-45. The outfit for this job consists of a GL2C carbureter with a small muffler or silencer attached. Hot exhaust, direct from the exhaust manifold, passes through the jacket of the carbureter and out through the silencer mentioned.

4—Explained in 3.

5—There is no official record of the maximum engine speed. The N.A.C.C. horsepower rating is 25.3.

6—There is no reason why they should require regrinding any oftener than in any other standard type of engine. When the cylinder is on the upstroke directly following the closing of the intake valve of that particular cylinder it is completing the compression stroke. When it is on the upstroke with the exhaust valve opening it is completing the firing stroke.

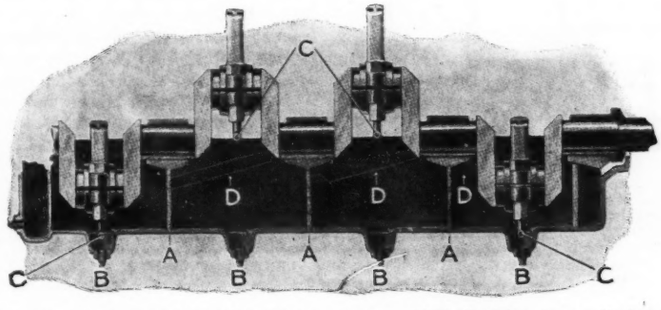


Fig. 9—Layout of crankcase oiling system used on 1910 Cadillac four-cylinder engine

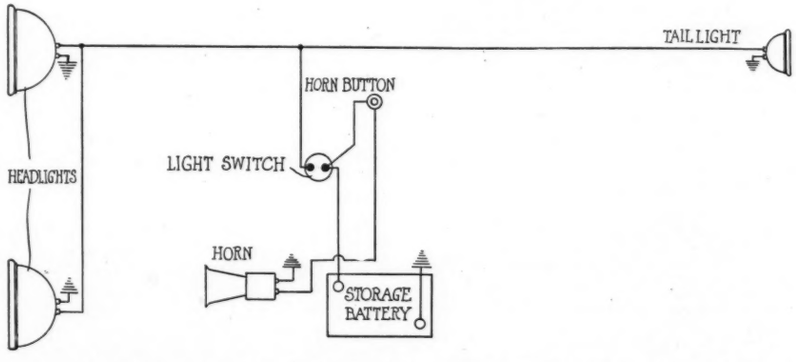


Fig. 10—Diagram for wiring Hudson 33 for lights and horn from storage battery located on left running board

7—The design of the engine is such that an attempt to install counterbalanced crankshafts is not recommended.

8—The course you outline would surely prepare you well for entry into the motor car business. The education should be interspersed, possibly in summer vacations, with practical experience in draughting, shop practice and general office work. One summer spent as a tester or repairman in a manufacturing plant or even in a garage would give you an insight in this end of the work, and it is really invaluable.

Wiring for Hudson 33

Salem, Ill.—Editor MOTOR AGE—Publish diagram for wiring a Hudson 33 for lights and horn from a storage battery located on the left running board.—S. R. Coleman.

A diagram of a simple wiring to lay out the system you ask for is shown in Fig. 10. It is a ground wire system with current return through the frame. The positive battery wire leads to a switch on the cowl board which, when closed, connects the battery with the headlights and tail light. These lights are grounded and return current passes through the frame to the negative pole of the battery, which is grounded to the frame as shown. A wire lead from the battery pole of the light switch goes to the horn button as shown.

Data on Race Drivers

Memphis, Tenn.—Editor MOTOR AGE—Why does not Teddy Tetzlaff enter races?
2—How old was the late David Bruce Brown when he became a race driver?
3—Where did he start racing?
4—Did he win any races at Dieppe when he was abroad?
5—Kindly publish a picture of the Fiat he drove in 1912, and what has become of the car?
6—Did he win any races in France in 1912?—Will Eldridge.

1—He has retired from active racing and is now selling cars on the Western coast.

2—He was 20 years old.

3—In 1907. His first appearance was in an Oldsmobile at the Empire City track.

4—In the French Grand Prix in 1912 he won the first leg of the 2-day event and finished third, but was disqualified for taking on gasoline outside a regular station, which was against the rules.

5—A photograph of the car is shown in Fig. 8. His car was purchased by a private owner and we do not know what has become of it since.

6—See answer No. 4.

Mitchell Into Speedster

Lacon, Ill.—Editor MOTOR AGE—Illustrate a way to cut down a 1909 Mitchell four-cylinder into a speedster.—Chas. F. Smith.

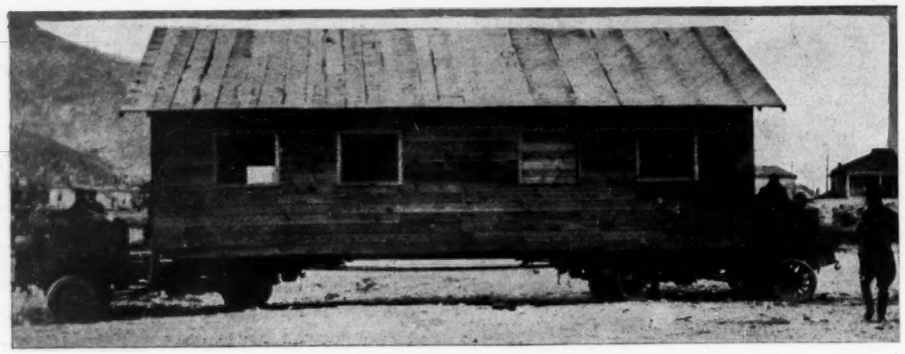
The illustration in Fig. 9 shows an attractive remodelled job on this car.

Answers J. Edgar Finn

Bridgewater, Iowa—Editor MOTOR AGE—I notice in the March 15 issue a question by J. Edgar Finn, Brooklyn, N. Y., asking why the pinion shaft bearing in the Regal transmission has to be replaced so often.

I wish to say that if he will use a very light grease or oil in the transmission he will have no more trouble. I have found this to be true in my experience.—Harold L. Johnson.

From the Four Winds



TRUCKS MOVE HOUSE 7 MILES ACROSS COUNTRY—When the last of the National Guard was ordered home from the Mexican border it was necessary to move this company house 7 miles. This shows how four F-W-D trucks did it

WEBSTER, Mass., Motorists Organize—The Webster, Mass., Motor Club has been formed with the following officers: Charles P. Doane, president; Frank I. Sears, vice-president; Dr. George C. Littlefield, secretary-treasurer.

Hartford Protects Traffic Police—Traffic police on duty at night at Hartford, Conn., are to be protected from traffic. Spotlights have been arranged at the various stations so that the policeman is shown forth in all his electric glory. The scheme according to the police has worked out very well.

Chalmers Moves 15-Ton Hammer—A stock Chalmer chassis recently moved a 15-ton steam hammer from the freight car to the Chalmers forge shop. It was the heaviest load ever hauled, but the truck held in readiness was not used at all. The steam hammer was on a platform with rollers under it, which meant that the car went only a few feet at a time before the position of the rollers had to be changed.

Good Through Fire and Water—When the steamer Wissely caught fire at sea and was beached on the Chinese coast it had eighteen six-cylinder Overland cars in its hold. The steamer was on fire for several days before sinking to the bottom, where it lay three months. The steamer was raised finally, and the cars were raised with it. And it cost just $200 each, on an average, to make the cars ready for service.

Toll to Enter Eastern Canada—Increased toll charges have been proposed for Victoria Bridge, the only outlet to and from Eastern Canada. This will affect American tourists. Protests are being made by the Montreal Automobile Trade Association, which wants the bridge made free from tolls. Trucks would pay 90 cents, having to buy a return ticket when crossing. If it returns unloaded 50 per cent of the ticket will be refunded.

Half Fee for Used-Car Side Line—An ordinance to require a yearly license fee of $50 for conducting a used-car business separate from new car dealing, and $25 for operating a used-car business in connection with selling new cars, has been brought before the Denver city council by the Automobile Trades Association of Colorado. The object of the new measure is to improve the system of licensing used-car dealers under the present law, which compels every dealer handling used cars to pay a $50 fee, regardless of whether he is running a strictly used car business or merely selling used cars which he takes in on sales of new cars.

Portsmouth Club Is Formed—The Portsmouth, Ohio, Automobile Club has been organized with 125 members. The town has 20 miles of paved road and will build 8 or 10 more this year.

A Truck That Is a Restaurant—C. P. Burns, of Wenatchee, Wash., has hit upon a new and novel use for his G. M. C. truck. In the past winter season Mr. Burns has officiated at the coffee urn and handed out the hot dogs to the hungry farmers at the sales held by the ranchers. He used to haul his supplies in a two-horse wagon and borrowed the use of a stove from the farmer's wife. Now he has a veritable kitchen on wheels, complete with stove, tables and benches.

Rock Island Association Formed—Thirty garage owners and motor car accessory and tire dealers of Moline, East Moline, Rock Island, Silvis and Watertown, Ill., organized the Rock Island County Automobile Association. Meetings will be held regularly to discuss matters calculated to benefit the members of the association, bring about co-operation and eliminate price-cutting and other matters.

Jackson County, Missouri, Organizes—The Jackson County Permanent Highway Association has been formed in Kansas City, Mo., with president, F. J. Bannister, and vice-president, J. G. Paxton.

Warns Against Car Thefts—Lewis Harthill, superintendent of police, Minneapolis, Minn., has started the Merchants Bulletin to warn against expected invasion of thieves, and the second issue concerns motor cars. He asks that motor cars stored in garages under suspicious circumstances be reported at once to the police for investigation. Co-operation is asked of dealers, garage owners and special policemen of the Auotmobile Club of Minneapolis.

A Checkerboard That Travels—Theodore B. Roach, general sales representative of the Mitchell in Wisconsin and Upper Michigan, has had one of the latest Mitchell models painted black and white in large squares, representing a huge checkerboard on wheels, as an advertising stunt. In each white square is the name of a Mitchell dealer in the territory. Mr. Roach covers the state and upper peninsula in the car whenever road conditions permit.

Trucks and Cars Campaign—Motor trucks are to be used by the marines' recruiting station at St. Paul, Minn., to tour the state in the recruiting service. Literature will be distributed from the truck. The National Non-partisan League has bought 100 Ford cars to use in a farmers' political campaign. This is said to be the largest single consignment to a buyer in the Northwest. The league owns as many more Fords, and each will carry one organizer to tour the state, so that every farmer will be visited.

Three Hundred at State Meeting—Three hundred attended the convention of the Ohio State Automobile Association at Springfield. A resolution pledging support of the President and Congress was passed, and copies of it were telegraphed to Washington. These officers were elected: President, Royal R. Scott, Toledo; vice-presidents, George H. Kile, Akron, F. H. Bentley, Warren, George E. Mentel, Springfield, and D. R. Roemer, Zanesville; secretary, Fred H. Caley, Cleveland; treasurer, H. E. Freeman, Springfield.

Dealers Plan Hill Climb—The first motor car hill-climbing contest held in California for years is being planned by the Motor Car Dealers' Association of San Bernardino. It is proposed to make the climb up Waterman's canyon, the approach to the 101 miles on the rim of the world route. The road rises to an elevation of 5000 ft. in about 10 miles, and there are dozens of hairpin turns and switchbacks. It is proposed to limit the entry to cars represented by San Bernardino dealers, and they must be strictly stock models.

Sherman-Sheridan Highway Is Started—Two representatives from each of eight counties in Southern Ohio have been elected governors of the new Sherman-Sheridan Highway Association. Two legs of the proposed new highway from Cincinnati, Ohio, to Wheeling, W. Va., were mapped out and pass through Hamilton, Clermont, Warren, Clinton, Fayette, Pickaway, Fairfield and Muskingum Counties.

Coming Motor Events

CONTESTS

—1917—

May	10	Uniontown, Pa., speedway.
May	19	New York, speedway.
May	30	Walla Walla, Wash., track.
May	30	Uniontown, Pa., speedway.
May	30	Cincinnat, Ohio, Speedway.
June	9	Chicago, speedway.
June	16	Kansas City, Mo., speedway.
June	23	Cincinnati, Ohio, speedway.
July	4	Visalia, Cal., road race.
July	4	Spokane, Wash., track.
July	4	Benton Harbor, Mich., track.
July	4	Uniontown, Pa., speedway.
July	4	Tacoma, Wash., speedway.
*July	4	Omaha, Neb., speedway.
July	15	Missoula, Mont., track.
July	17-19	Intercity Reliability.
July	22	Anaconda, Mont., track.
July	29	Great Falls, Mont., track.
Aug.	4	Kansas City, Mo., speedway.
Aug.	5	Billings, Mont., track.
*Sept.	3	Cincinnati, Ohio, speedway.
Sept.	6	Red Bank, N. J., track.
Sept.	8	Pike's Peak, Colo., hill climb.
*Sept.	15	Providence, R. I., speedway.
Sept.	22	Allentown, Pa., track.
Sept.	28	Trenton, N. J., track.
*Sept.	29	New York, speedway.
Sept.	30	Uniontown, Pa., speedway.
Oct.	6	Kansas City, Mo., speedway.
Oct.	6	Uniontown, Pa., speedway.
Oct.	6	Danbury, Conn., track.
*Oct.	13	Chicago, speedway.
Oct.	13	Richmond, Va., track.
Oct.	27	New York, speedway.

* A. A. A. Championship Award Event.

SHOWS

April 20-26—Milwaukee, Wis.

Among the Makers and Dealers

TRACTOR Co. Obtains Site—The Standard Tractor Co., Regina, Sask., has obtained a site on which a plant will be erected soon.

G. M. Opens California Branch—The General Motors Truck Co. has opened a factory branch in San Francisco. W. B. Cochran is in charge.

Goodrich Reduces Its Capital—The B. F. Goodrich Co., Akron, Ohio, has filed a certificate with the Secretary of State announcing a reduction of capital from $87,300,000 to $86,400,000.

Walden Returns to Chalmers—A. E. Walden, who resigned from the Chalmers experimental department to become service manager for C. T. Silver, has returned to Chalmers as experimental engineer.

To Close Shop Sunday—Motor car and accessory dealers of San Antonio, Tex., have announced that beginning the first Sunday in May their stores and shops will close every Sunday and important holiday.

Connors Gets Marathon Promotion—C. J. Connors, formerly special representative for the Marathon Tire & Rubber Co. in the Southwest, has been appointed manager of the division office and warehouse in St. Louis, Mo.

Uswald Leaves Bosch Magneto—S. Uswald, for the last nine years with the Bosch Magneto Co., New York, in the service, sales and advertising departments, has joined the P. J. Durham Co. as assistant to the sales manager.

Bell Joins Norma Company—Norman Bell, formerly sales engineer in the motor car division of the Lunkenheimer Co., Cincinnati, Ohio, has joined the Norma Co. of America, New York, maker of bearings, in a similar capacity.

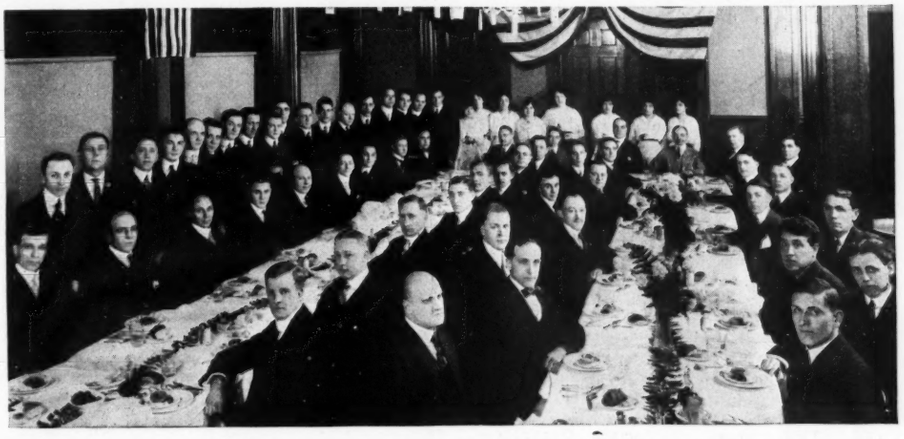
Thomas with Stearns Company—J. V. Thomas is with the F. B. Stearns Co., Cleveland, Ohio, as assistant sales manager and advertising manager. He was formerly with the Moon Motor Car Co., where he held a similar position.

Firestone Transfers Clinton—John T. Clinton, manager of the Buffalo branch of the Firestone Tire & Rubber Co., has been sent to Boston, Mass., to manage the branch there, succeeding Dan C. Swander, who has joined the Motor Parts Co.

Latshaw Resigns from Pennsy—W. H. Latshaw, general manager of the Pennsy Motor Co., Pittsburgh, Pa., has resigned. G. L. Sintz, assistant engineer of Pennsy Motor Co., has resigned to become purchasing agent for the Pullman Motor Co., of York, Pa.

Hood Rubber Co. Expands—To take care of its growing business and arrange for a production of 2000 tires a day, the Hood Rubber Co., Watertown, Mass., is erecting an addition to its plant. The new structure will provide 80,000 sq. ft. of floor space and will allow for a continuous working plan of 24 hr. At present the company turns out 300 tires a day.

Bosch Signs More Contracts—The Bosch Magneto Co., New York, has signed contracts with the following companies to use Bosch magnates for the coming season: Finley Robertson Porter Co., Port Jefferson, L. I.; Bethlehem Motors Corp., Allentown, Pa.; Larrabee-Deyo Motor Truck Co., Binghamton, N. Y.; Brewster & Co., Long Island City; Roberts Motor Mfg. Co., Sandusky, Ohio; Kleiber & Co., San Francisco; Winton Co., Cleveland, Ohio; Jordan Motor Car Co., Cleveland, Ohio, and the Sterling Automobile Mfg. Co., Amston, Conn.



FALLS EFFICIENCY CLUB HOLDS MONTHLY BANQUET—The Efficiency and Safety First Club is an important part of the Falls Motor Co. organization. The picture was taken at their regular monthly banquet

Trinkle Field Service Manager—F. A. Trinkle has been appointed field service manager for the United States Motor Truck Co., Cincinnati, Ohio.

New York U. S. Tire Dividend Declared—United States Tire Co. has declared a quarterly dividend of 2 per cent on first preferred to stock of record April 16, payable April 30.

French Distributor Visits U. S. Truck—M. Gaston Vidie, Paris, France, was a recent visitor to the United States Motor Truck Co., Cincinnati, Ohio. He is a member of Ateliers Atlas, distributor of U. S. trucks in France, and wishes to have his allotment increased. Orders for trucks are accepted by him only when they are for commercial purposes.

NATIONAL PLANT OBSERVES NAME—More than 1000 National employes attended flag-raising ceremonies at the National Motor Car & Vehicle Co.'s factory

Two Leave American Motors—M. I. Brock, sales director, and John C. Spears, manager of production, have resigned from the American Motors Corp., Plainfield, N. J.

Corbitt Truck Increases Capital—The Corbitt Motor Truck Co., Henderson, N. C., has increased its capitalization to $1,000,000. The output will be increased to 1500 trucks a year.

Paige Has Big Business—The Paige-Detroit Motor Car Co. transacted business in March totalling $2,755,000. This is the largest March record in the company's history.

Willys-Overland Declares Dividend—Willys-Overland Co., Toledo, Ohio, has declared a quarterly dividend of 75 cents a share on common, payable May 1 to stock of record April 18.

Chilcott is Nash Distributor—W. K. Chilcott, formerly sales manager of the General Motors Truck Co., will head the Chilcott-Nash Co., Seattle, Wash., which has been organized to distribute Nash cars in the Northwest.

Peerless Elects 1917 Directors—The Peerless Truck and Motor Corp. has elected the following board of directors: W. M. Coleman, F. L. Dame, T. W. Frech, F. Gilbart, William E. S. Griswold, E. W. Harden, L. H. Kittredge, R. H. Rice, G. V. Rich, F. S. Terry, B. G. Tremaine, P. D. Wagoner and Harrison Williams.

Boston and Chicago Salesmen Compete—A sales contest between the men identified with the Connell & McKone Co. at Boston, Mass., and the Chicago Willys-Overland Co., is being carried on this month. The salesmen and some of the service men in both organizations subscribed $10 each for a purse, and additional sums of $100 have been put up by the managers of both agencies.

Reeke Becomes Nash Motors Agent—Alfred Reeke, who recently resigned as general sales manager of the Nash Motors Co., Kenosha, Wis., will re-engage in motor car distribution at Milwaukee, Wis. Mr. Reeke, who was identified with the sale of Rambler and Jeffery cars in Milwaukee for many years prior to joining the factory organization, has formed the Alfred Reeke Co. to act

as distrbiuter of Jeffery trucks in Wisconsin and Upper Michigan and as Milwaukee county dealer in the Jeffery passenger car.

Jaeger Buys Tire Plant—The Jaeger Machine Co., Columbus, Ohio, has purchased the plant formerly operated by the Midgley Tire Co. and lately owned by the United States Tire Co.

Brewster in New Cassidy Position—C. F. Brewster, formerly located at Philadelphia, Pa., has been appointed special factory representative for the Edward A. Cassidy Co., with headquarters in Detroit.

Pearce Tire Adds Land—The Pearce Tire & Rubber Co., Ashtabula, Ohio, has purchased 5 acres of additional land adjoining its plant, which makes a total of 9¾ acres. It also has options on 8½ more acres.

To Make Sheet Metal Parts—The G. Mitchell & Son Co., Cleveland, Ohio, has purchased a site and plans to build a plant to manufacture motor car sheet metal parts. It will cost about $250,000.

5390 Doble Cars Ordered—The General Engineering Sales Co., Detroit, has received orders with deposits made on each order for 5390 Doble Steam Cars. The business amounts to $10,106,250 net.

G. M. Export Moves—The General Motors Export Co. is moving its sales and executive offices to New York, where the order, accounting and traffic departments are now located.

To Supply Garford Sheet Metal—The Columbus Auto Brass Co., Columbus, Ohio, has closed a contract with the Gramm Motor Truck Co., Lima, Ohio, to supply all sheet metal parts for Garford trucks made by the Gramm concern.

Studebakers for Canadian Army—The Imperial Munition board of Canada has ordered thirty-two Studebaker six-cylinder, 50 h.p. combination station and passenger cars. These cars are to be put in immediate service at Camp Borden.

Bellefontaine and Economy Consolidated—The Bellefontaine Automobile Co., Bellefontaine, Ohio, and the Economy Motor Co., Tiffin, Ohio, have been consolidated. A. J. Miller is president, and Fred C. Spitle is treasurer. For the present the manufacture of cars will be conducted in the Tiffin factory, but the plant will be moved to Bellefontaine as soon as possible, and new buildings will be erected on land adjoining the present structure.

TRUEING OVERLAND TIRES—Each tire is inspected and tested for alignment after the wheel has been assembled at the Willys-Overland Co. plant

Adams Leaves Continental Motors—Robert A. Adams, purchasing agent of the Continental Motors Corp., Detroit, has resigned to return east.

Wilson Body Co. to Build—Arrangements have been completed whereby the Wilson Body Co. will erect a large plant in Bay City, Mich. Contracts will call for the completion of the buildings before July 1.

Deshler Spring Wheel Organizes—The Deshler Auto Spring Wheel Co. has been organized at Deshler, Neb., with a capital of $100,000. The company will manufacture a steel spring motor car wheel patented by W. Nance, who is president of the company. Gregor Langs is vice-president; H. Schlamann, secretary-treasurer. A site for the factory has been selected and a two-story brick building will be erected.

Hartley Joins Dorris Company—J. J. Hartley has become works manager of the Dorris Motor Car Co., St. Louis, Mo.

Evinrude Motor to Expand—The Evinrude Motor Co., of Milwaukee, Wis., which recently entered the tractor motor field, is planning an addition to cost $25,000.

Standard Tire Increases Capital—The Standard Tire & Rubber Co., Willoughby, Ohio, has increased its capital from $400,000 to $750,000.

New Radiator Maker Organizes—The Kuenz Radiator & Sheet Metal Co., Toledo, Ohio, has been incorporated with a capital of $50,000 to manufacture motor car radiators. It is successor to the business of Joseph Kuenz.

Fisher Goes to Curtiss Factory—R. A. Fisher has been appointed production manager of the Curtiss airplane factory at Buffalo, N. Y. Mr. Fisher was formerly superintendent of the Continental Foundry & Machine Co., Fort Madison, Mich.

Kerosene Motor Co. Formed—The Kerosene Motor Co., Peoria, Ill., has been formed with a capital stock of $100,000 to manufacture kerosene transformers. Work has been started. George McFarland is president; E. M. Smith, vice-president; F. H. Bush, secretary-treasurer.

Miquelon with Maxwell—R. C. Miquelon, Quebec City, has been appointed by the Maxwell Motor Co., Ltd., special representative for the Province of Quebec. He has for some time been the Eastern Canadian representative for the Chalmers Motor Co. of Canada.

Canadian Ford Tractor Co.—The Ford Tractor Co. of Canada, Ltd., Toronto, Ont., has been incorporated with a capital stock of $10,000,000. This company has acquired the rights of the Ford Tractor Co., Inc., including the patent rights within the Dominion for the Ford tractor.

Marathon Increases Dividend Rate—The Marathon Tire & Rubber Co., Cuyahoga Falls, Ohio, has increased its dividend rating from a 6 to a 7 per cent basis, payable 1¾ per cent quarterly. The company has received orders increased 75 per cent since the first of the year over the corresponding period of last year.

Recent Incorporations

Ashland, Ky.—Nelson Motor Car Co.; capital stock, $10,000; incorporators, J. H. McCleart, Hays Nelson and E. L. Helfrich.

Canton, Ohio—Jobe-Conrad Motor Car Co., to sell motor cars; capital stock, $10,000; incorporators, Clyde G. Jobe, Bernard J. Conrad, Ira A. Aungst, Carrie B. Jobe and Ella Aungst.

Chattanooga, Tenn.—Taxicab Auto Service Co., to conduct a taxicab and motor car line; capital stock, $5,000; incorporators, E. B. Shadden, W. M. Fry, J. R. Dickson, M. F. Mitchell and C. A. Moore.

Chicago—Chicago Motor Haulage Co.; capital stock, $10,000; incorporators, George J. Kolkow, W. M. Hopkins and George P. Boyle.

Chicago—Ray F. Mudd Motor Co.; capital stock, $25,000; incorporators, Francis O'Shaughnessy, John F. Rosen and Joseph L. Toohey.

Chicago—Daniels Motor Sales Co.; capital stock, $10,000; incorporators, Bennison F. Bartel, Albert C. Bell and W. F. Heinemann.

Chicago—Universal Auto Sales Co.; capital stock, $12,000; incorporators, James C. Orny, Otto Kerner and DeWitt C. Jones.

Cleveland, Ohio—Cleveland Top and Specialty Co., to manufacture tops; capital stock, $20,000; incorporator, E. T. Buhl.

Cleveland, Ohio—Francis-Rand Co., to manufacture accessories; capital stock, $10,000; incorporators, A. E. Francis, Paul A. Clotzbaugh, H. F. Reid, Jesse A. Fenner and F. W. Stanton.

Cleveland, Ohio—Lake City Tire & Supply Co., to deal in tires and tubes; capital stock, $10,000; incorporators, H. C. Christy, Jr., A. H. Massey, F. R. Gustafson, M. C. Haugh and C. B. Bayly.

Cleveland, Ohio—G. & G. Motor Co., to sell motor cars; capital stock, $5,000; incorporators, Harry C. Gahn, Garry C. Greene, N. M. Thorp, C. A. Riemenschneider and Wm. F. Gholson.

Cleveland, Ohio—Ohio Trailer Co., to manufacture trailers; capital stock, $300,000; incorporators, E. C. Spader, M. F. McFadden, N. H. Ficht, R. M. Schrod and M. C. Hayes.

Cleveland, Ohio—Motor-Truck Sales Co., to sell trucks; capital stock, $25,000; incorporators, Henry J. Foster, Herbert D. Andress, Ivan Katzenstein, Howard Katzenstein and Earl Katzenstein.

Cleveland, Ohio—Forster Mfg. Co., to manufacture accessories; capital stock, $30,000; incorporators, Sterling Newell, Earnest Angell, W. L. Fleming, Andrew P. Martin and C. C. Owens.

Cincinnati, Ohio—Auto Products Mfg. Co., to deal in accessories; capital stock, $12,000; incorporators, Clifford Greene, A. B. Breeze, W. W. Helmolz, G. B. Jolly and Henry B. Street.

Cincinnati, Ohio—M. J. Moore Co., to deal in motor cars; capital stock, $50,000; incorporators, Sue L. Moore, James T. Bartlow, A. E. Scott, Edward H. Jones and M. J. Moore.

Dover, Del.—Fabri-Cord Tire Co., to manufacture rubber tires and rubber products; capital stock, $2,000,000; incorporators. Herbert E. Latter, Norman P. Coffin and Clement M. Egner.

Detroit—Boerzig Motor Sales Co.; captial stock, $15,000; incorporators, E. J. Boerzig, P. Katus and F. Katus.

Detroit—Kent Motors Co.; capital stock, $5000; incorporators, Charles Wright, Jr., E. P. Snyder and J. L. Vett.

Fostoria, Ohio—Blaser Body Co., to manufacture motor car bodies; capital stock, $50,000; incorporators, Julius Schindler, Fred Wilson, Peter J. Blaser, Henry Ockschim, Herbert Wilson and A. C. Dumont.

Geneva, Ohio—Geneva Tractor Co., to manufacture tractors; capital stock, $20,000; incorporators, Frank G. Jacobs, George S. Jacobs, Glenn C. Webster, A. W. Chamberlin and A. M. Ford.

Glasgow, Mont.—Magruder Motor Co.; capital stock, $25,000; incorporators, H. W. Magruder, G. C. Magruder and D. Magruder.

Grand Forks, N. D.—General Motor Sales Co., Inc.; capital stock, $50,000; incorporators, Carter H. Murphy, Earl McFadden and W. F. Davey.

Indianapolis, Ind.—Gould Motor & Mfg. Co., to manufacture motor cars and airplanes; capital stock, $100,000; incorporators, S. O. Gould, F. M. Beshore and E. S. Payntor.

Joliet, Ill.—Frank L. Kiep & Kahn Auto Co., capital stock, $6,000; incorporators, Frank L. Kiep, Michael Kahn and Hugo Marcus.

Lexington, Ky.—Service Tire Co.; capital stock, $10,000; incorporators, S. L. VanMeter, Jr., M. A. Bosworth and A. F. Geiser.

Louisville, Ky.—Stiles Motor Co.; capital stock, $20,000; incorporators, K. S. Stiles, J. W. DeHart and J. M. Clifford.

Mansfield, Ohio—Toledo Standard Motor Co., to sell motor cars; capital stock, $15,000; incorporators, C. E. Ozier, E. C. Ozier, F. H. Wharf, C. P. Brindle and F. W. Button.

Mansfield, Ohio—North Side Auto Co., to deal in motor cars; capital stock, $10,000; incorporators, J. B. Picking, H. W. Fleck, M. F. Leppo, W. H. Leppo and William Pugh.

Milwaukee, Wis.—Fred Goetz Co., to manufacture and market oils, greases, soaps, cleaning compounds, etc.; capital stock, $25,000; incorporators, Fred Goetz, E. Wolfe and E. R. Jeske.

Milwaukee, Wis.—Tobin Sales Co., to deal in Ford and other motor cars, operate garage and repairshop, etc.; capital stock, $20,000; incorporators, Harry Tobin, J. J. Dougherty and George Wolter.